

PATENT ABSTRACTS OF JAPAN

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(54) PRODUCTION OF SUBSTRATE FOR INFORMATION RECORDING MEDIUM AND INFORMATION RECORDING MEDIUM

(57)Abstract:

PROBLEM TO BE SOLVED: To continuously carry out uniform treatment for inhibiting the leaching of glass components from a glass-base substrate for a long time while maintaining the effect of the treatment by bringing the substrate into contact with a molten salt contg. at least a hydrogensulfate and/or a pyrosulfate and inhibiting the crystallization of the molten salt.
SOLUTION: The pyrosulfate is a salt of pyrosulfuric acid (H₂S₂O₇) and the hydrogensulfate is that of an alkali metal, an alkaline earth metal, ammonium or the like. A substrate for an information recording medium is immersed in the molten salt or only one face of the substrate is brought into contact with the molten salt. The temp. of the molten salt is preferably the melting temp. or liq. phase temp. to 500° C and below the sublimation temp. of the molten salt. The crystallization of the molten salt is inhibited by feeding water to the molten salt or replenishing the water lost from the molten salt. The degeneration of the glass surface and the occurrence of foreign matter due to the migration of alkali metal ions to the surface are prevented.

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CLAIMS

[Claim(s)]

- [Claim 1] The manufacture approach of the substrate for information record media characterized by performing processing which controls crystallization of fused salt in case processing which the substrate which used the glass for information record media as the principal component is contacted to the fused salt which contains a hydrogensulfate and/or pyrosulfate at least, and controls the elution of a glass component is performed.
- [Claim 2] The manufacture approach of the substrate for information record media according to claim 1 characterized by performing processing which is contacted to said fused salt and controls the elution of a glass component, and processing which controls crystallization of fused salt after chemical-strengthening processing of a glass substrate, and performing processing by said fused salt at temperature lower at least 50 degrees C than chemical-strengthening processing temperature.
- [Claim 3] The manufacture approach of the substrate for information record media according to claim 1 or 2 characterized by performing processing which is contacted to said fused salt and controls the elution of a glass component under at the sublimation temperature of this fused salt.
- [Claim 4] The manufacture approach of the substrate for information record media according to claim 1 to 3 that the glass component which controls elution is characterized by being alkali ion.
- [Claim 5] The manufacture approach of the substrate for information record media according to claim 1 to 4 that processing which controls crystallization of fused salt is characterized by being the processing which supplies moisture to fused salt.
- [Claim 6] The manufacture approach of the substrate for information record media according to claim 1 to 5 characterized by the processing which controls crystallization of fused salt being the processing with which the moisture lost from fused salt is compensated.
- [Claim 7] The manufacture approach of the substrate for information record media according to claim 1 to 6 characterized by the fused salt containing a hydrogensulfate and/or pyrosulfate being the fused salt which comes to add a sulfuric acid further.
- [Claim 8] The manufacture approach of the substrate for information record media according to claim 5 or 6 characterized by the approach of compensating the supply approach of moisture or moisture being the approach of introducing a steam into fused salt.
- [Claim 9] The manufacture approach of the substrate for information record media according to claim 5 or 6 characterized by the approach of compensating the supply approach of moisture or moisture being an approach of putting fused salt on the bottom of a steam ambient atmosphere.
- [Claim 10] The manufacture approach of the substrate for information record media according to claim 5 or 6 that the approach of compensating the supply approach of moisture or moisture is characterized by being the approach of adding a hydrogensulfate to fused salt.
- [Claim 11] The manufacture approach of the substrate for information record media according to claim 1 to 10 characterized by for the temperature of fused salt being melting temperature or liquid phase temperature -500 degree C, and being under the sublimation temperature of fused salt.
- [Claim 12] By the manufacture approach of the substrate for information record media a publication, to either according to claim 1 to 11 The ion exchange of Na^+ of Si-O-Na is carried out to hydronium ion, and a glass front face will be in a hydration condition from the condition of Si-O-Na of not constructing a bridge. Then, the manufacture approach of the substrate for information record media characterized by changing into the condition that the silanol group was formed of heating dehydration, the silanol group was dehydrated, and bridge formation-ization of Si-O-Si was made on the glass front face by it.
- [Claim 13] The manufacture approach of the substrate for information record media characterized by changing a glass substrate front face into the condition that bridge formation-ization of Si-O-Si was made from the condition of Si-O-Na of not constructing a bridge, by the manufacture approach of the substrate for information record media given in either according to claim 1 to 11.
- [Claim 14] The manufacture approach of the substrate for information record media according to claim 1 to 13 characterized by the substrate for information record media being a glass substrate to which chemical-strengthening processing was performed.
- [Claim 15] The manufacture approach of the substrate for information record media according to claim 1 to 13 that the substrate for information record media is characterized by being a glass-ceramics substrate.
- [Claim 16] The manufacture approach of the substrate for information record media according to claim 1 to 15 characterized by the substrate for information record media being a substrate used for the magnetic disk played with a magnetic-reluctance mold head.
- [Claim 17] The information record medium characterized by forming a record layer at least on the substrate for information record media obtained using the manufacture approach of the substrate for information record media according to claim 1 to 16.
- [Claim 18] The manufacture approach of the glassware characterized by performing processing which controls crystallization of fused salt in case processing which the product which used glass as the principal component is contacted to the fused salt which contains a hydrogensulfate and/or pyrosulfate at least, and controls the elution of a glass component is performed.
- [Claim 19] The manufacture approach of the glassware according to claim 18 characterized by performing processing which is contacted to said fused salt and controls the elution of a glass component under at the sublimation temperature of this fused salt.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the manufacture approach of the substrate for information record media, an information record medium, etc.

[0002]

[Description of the Prior Art] In recent years, the glass substrate and ceramic substrate which are excellent in various properties as a substrate for information record media as compared with other ingredients attract attention. In detail, as a substrate for magnetic disks, although many aluminum substrates were used, with the request of the miniaturization of a magnetic disk, sheet-metalizing, or the reduction in surfacing of the magnetic head, compared with an aluminum substrate, a miniaturization and sheet-metalizing are easy, and since display flatness is high and the reduction in surfacing of the magnetic head etc. is easy, the rate using a glass substrate or a ceramic substrate has been increasing.

[0003] When using a glass substrate as a substrate for information record media, chemical-strengthening processing is performed to a glass substrate front face, and improvement in on the strength is aimed at in many cases in order to prevent that raise shock resistance and vibratility-proof and a substrate is damaged by the impact or vibration. It is based on the approach (ion-exchange method) of permuting the alkali ion in glass by alkali ion with a larger ionic radius than it, making generate compressive stress strong against a glass surface by the increment in the volume of the ion-exchange section, and strengthening a glass front face as chemical-strengthening processing, for example etc. in many cases. When performing a chemical strengthening using an ion-exchange method, it is necessary to use the glass substrate containing the principle top alkali ion. In addition, even if it does not perform chemical-strengthening processing, the glass types (for example, high valence glass etc.) which have predetermined reinforcement are also in the glass substrate for information record media containing alkali ion.

[0004] Since shock resistance and vibratility-proof improve by crystallization when using a ceramic (for example, glass ceramics) substrate as a substrate for information record media, chemical-strengthening processing is not usually needed.

[0005] When using glass and a ceramic substrate as a substrate for information record media, it is desirable for the elution of the alkali contained in glass or a ceramic substrate to pose a problem in many cases, and to stop the elution of alkali as much as possible. The elution of alkali poses a problem also about the glass substrate after ion exchange treatment.

[0006]

[Problem(s) to be Solved by the Invention] Although the elution of alkali poses a problem when using glass and a ceramic substrate as a substrate for information record media as mentioned above, most techniques which control the elution of alkali by high RE ** RU are not developed.

[0007] This invention aims at offer of the manufacture approach of the substrate for information record media which can be continuously processed to homogeneity for a long period of time etc., maintaining the effectiveness of processing while it is made under the above-mentioned background and can control the elution of the alkali from a glass substrate, or other components by high RE ** RU.

[0008]

[Means for Solving the Problem] By it being immersed in fused salt, such as a hydrogensulfate, and processing the glass substrate for information record media containing alkali ion, an applicant for this patent finds out that the elution of alkali can be stopped remarkably, and has already applied (Japanese Patent Application No. No. 365326 [nine to]). The reason (mechanism) which can control the elution of the alkali from a glass substrate by high RE ** RU here if it is immersed in fused salt, such as a hydrogensulfate, and a glass substrate is processed From the condition of Si-O-Na in the maximum surface layer of glass of not constructing a bridge, the hydronium ion and Na⁺ of Si-O-Na which are produced from the moisture contained in a hydrogensulfate carry out the ion exchange. It is thought that it is because it becomes a silanol group (Si-O-H), and a silanol group is dehydrated by the afterbaking and bridge formation-ization of Si-O-Si is made on a glass front face. Moisture evaporated, the crystal of pyrosulfate (for example, K₂S₂O₇) deposited, and this invention persons found out that the effectiveness of processing fell, when processing was continued with fused salt, such as a hydrogensulfate (for example, KHSO₄), as a result of repeating research further (for example, the reaction of 2KHSO₄ → K₂S₂O₇ + H₂O** will occur, and KHSO₄ will be set to K₂S₂O₇). And it came to complete header this invention for the ability to process to homogeneity continuously by compensating processing liquid with moisture for a long period of time, maintaining the effectiveness of processing. Moreover, it found such effectiveness that it is not based on the class of glass or ceramic, for example, is also effective also about glass ceramics. Furthermore, it found out that elution could be stopped not only about alkali but about other leached moieties, such as an alkaline earth, and Si, Pb. The concrete data about elution depressor effect, such as an alkaline earth and Si, are shown in Table 1 and 2. Table 1 and 2 shows that processing by the fused salt of pyrosulfate and the fused salt of a hydrogensulfate is effective. in addition, the inside of the ultrapure water with which the elution test heated the glass substrate at 80 degrees C — 24 hours — being immersed — a leached moiety — ion chromatography — a quantum — carrying out — the elution volume (mumol/Disk) of the alkali-metal ion per glass substrate — it asked.

[0009]

[Table 1]

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(硝種：高原子価イオン含有ガラス)

処 理 方 法	溶出試験結果 ($\mu\text{mol/Disk}$)	
	Si	Mg, Ca
K2S2O7処理なし	10	3.3
K2S2O7処理 (300℃、5分)	4.4	1.5
水蒸気2時間供給後 K2S2O7処理 (300℃、5分)	4.4	1.5
水蒸気4時間供給後 K2S2O7処理 (300℃、5分)	4.4	1.5

K2S2O7液相温度:210℃

[0010]

[Table 2]

(硝種：高原子価イオン含有ガラス)

処 理 方 法	溶出試験結果 ($\mu\text{mol/Disk}$)	
	Si	Mg, Ca
KHSO4処理なし	10	3.3
KHSO4処理 (300℃、5分)	4.5	1.6
水蒸気2時間供給後 KHSO4処理 (300℃、5分)	4.5	1.6
水蒸気4時間供給後 KHSO4処理 (300℃、5分)	4.5	1.6

[0011] In addition, since not only the glass substrate for information record media but the alkali of a glass component causes YAKE of optical glass or glass tableware, an optical lens, prism, a light filter, optical waveguide, an optical module, an optical element and an optic, the glass for a display, the substrate glass for solar batteries, the substrate glass for semi-conductors, the substrate glass for image sensors, electronic parts, an imprint mask, the glass tableware of processing according to fused salt, such as a hydrogensulfate of the invention in this application, also when obtaining glassware with sufficient weatherability, etc. are effective.

[0012] In addition, the technique which performs dealkalinization on the front face of a substrate with wet to the bottom of existence of AlCl_3 , or (NH_4) is performed in an official announcement patent official report (***** No. 503403 [11 to]) by sublimation of a sulfate like ZSO_4 is indicated. However, since processing temperature is as low as 100 degrees C when AlCl_3 is used, the processing time becomes long with 24 hours as it is also in an example. On the other hand, when sublimation of a sulfate performs dealkalinization, in order to have to make a sulfate into a gas, 450-580 degrees C and an elevated temperature are required like an example. Since the invention in this application carries out dealkalinization processing to it by contacting a sulfate as fused salt at the temperature which itself melts, it is comparatively low temperature (an example 250-300 degrees C), and processing in a short time for about 5 minutes is possible. Therefore, the glass of large Tg range, such as glass with low Tg temperature, can be processed, or since it is low temperature treatment, it has the merit of not causing deformation of a glass substrate. Specifically, Tg of a glass substrate can apply the invention in this application to the thing near 400 degree C. Since the problem of causing crash if a glass substrate deforms since spacing of the glass substrate for information record media and the magnetic head is 40-50nm arises, deformation of the glass in the glass substrate for information record media poses a big problem. Moreover, in a ***** No. 503403 [11 to] official report, although dealkalinization processing of the glass which carried out chemical-strengthening processing at 500 degrees C is carried out by $2(\text{NH}_4) \text{SO}_4$ at 500 degrees C, if dealkalinization processing is carried out at the same temperature as chemical-strengthening processing, relaxation of stress will take place, the reinforcement of a glass substrate falls, and the fall of the glass substrate for information record media on the strength is caused. The invention in this application is carrying out dealkalinization processing to it at temperature lower 80-130 degrees C than chemical-strengthening processing, and since the processing time is also as short as 5 minutes, relaxation of stress hardly takes place. Moreover, even if it must process in the condition of having sealed and continuation operation is difficult, since it becomes a gas in sublimation of a sulfate, but it is not necessary to seal the invention in this application for a liquid, continuation operation is easy, and it carries out continuation operation in order to perform processing which controls crystallization of fused salt in case it is dealkalinization, it is possible to acquire the continuing effectiveness of dealkalinization.

[0013] This invention is considered as the following configurations.

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[0014] (Configuration 1) The manufacture approach of the substrate for information record media characterized by performing processing which controls crystallization of fused salt in case processing which the substrate which used the glass for information record media as the principal component is contacted to the fused salt which contains a hydrogensulfate and/or pyrosulfate at least, and controls the elution of a glass component is performed.

[0015] (Configuration 2) The manufacture approach of the substrate for information record media the configuration 1 publication characterized by performing processing which is contacted to said fused salt and controls the elution of a glass component, and processing which controls crystallization of fused salt after chemical-strengthening processing of a glass substrate, and performing processing by said fused salt at temperature lower at least 50 degrees C than chemical-strengthening processing temperature.

[0016] (Configuration 3) The manufacture approach of the substrate for information record media the configuration 1 characterized by performing processing which is contacted to said fused salt and controls the elution of a glass component under at the sublimation temperature of this fused salt, or given in two.

[0017] (Configuration 4) The manufacture approach of the substrate for information record media the configuration 1 whose glass component which controls elution is characterized by being alkali ion thru/or given in either of 3.

[0018] (Configuration 5) The manufacture approach of the substrate for information record media the configuration 1 whose processing which controls crystallization of fused salt is characterized by being the processing which supplies moisture to fused salt thru/or given in either of 4.

[0019] (Configuration 6) The manufacture approach of the substrate for information record media the configuration 1 characterized by the processing which controls crystallization of fused salt being the processing with which the moisture lost from fused salt is compensated thru/or given in either of 5.

[0020] (Configuration 7) The manufacture approach of the substrate for information record media the configuration 1 characterized by the fused salt containing a hydrogensulfate and/or pyrosulfate being the fused salt which comes to add a sulfuric acid further thru/or given in either of 6.

[0021] (Configuration 8) The manufacture approach of the substrate for information record media the configuration 5 characterized by the approach of compensating the supply approach of moisture or moisture being the approach of introducing a steam into fused salt, or given in six.

[0022] (Configuration 9) The manufacture approach of the substrate for information record media the configuration 5 characterized by the approach of compensating the supply approach of moisture or moisture being an approach of putting fused salt on the bottom of a steam ambient atmosphere, or given in six.

[0023] (Configuration 10) The manufacture approach of the substrate for information record media the configuration 5 to which the approach of compensating the supply approach of moisture or moisture is characterized by being the approach of adding a hydrogensulfate to fused salt, or given in six.

[0024] (Configuration 11) The manufacture approach of the substrate for information record media the configuration 1 characterized by for the temperature of fused salt being melting temperature or liquid phase temperature -500 degree C, and being under the sublimation temperature of fused salt thru/or given in either of 10.

[0025] (Configuration 12) By the manufacture approach of the substrate for information record media a publication, to either a configuration 1 thru/or 11 publications The ion exchange of Na^+ of Si-O-Na is carried out to hydronium ion, and a glass front face will be in a hydration condition from the condition of Si-O-Na of not constructing a bridge. Then, the manufacture approach of the substrate for information record media characterized by changing into the condition that the silanol group was formed of heating dehydration, the silanol group was dehydrated, and bridge formation-ization of Si-O-Si was made on the glass front face by it.

[0026] (Configuration 13) The manufacture approach of the substrate for information record media characterized by changing a glass substrate front face into the condition that bridge formation-ization of Si-O-Si was made from the condition of Si-O-Na of not constructing a bridge, by the manufacture approach of the substrate for information record media given in either a configuration 1 thru/or 11 publications.

[0027] (Configuration 14) The manufacture approach of the substrate for information record media the configuration 1 characterized by the substrate for information record media being a glass substrate to which chemical-strengthening processing was performed thru/or given in either of 13.

[0028] (Configuration 15) The manufacture approach of the substrate for information record media the configuration 1 whose substrate for information record media is characterized by being a glass-ceramics substrate thru/or given in either of 13.

[0029] (Configuration 16) The manufacture approach of the substrate for information record media the configuration 1 characterized by the substrate for information record media being a substrate used for the magnetic disk played with a magnetic-reluctance mold head thru/or given in either of 15.

[0030] (Configuration 17) The information record medium characterized by forming a record layer at least on the substrate for information record media obtained by a configuration 1 thru/or either of 16 using the manufacture approach of the substrate for information record media a publication.

[0031] (Configuration 18) The manufacture approach of the glassware characterized by performing processing which controls crystallization of fused salt in case processing which the product which used glass as the principal component is contacted to the fused salt which contains a hydrogensulfate and/or pyrosulfate at least, and controls the elution of a glass component is performed.

[0032] (Configuration 19) The manufacture approach of glassware given in the configuration 18 characterized by performing processing which is contacted to said fused salt and controls the elution of a glass component under at the sublimation temperature of this fused salt.

[0033]

[Function] By this invention, the elution of alkali can be remarkably stopped by it being immersed in fused salt, such as a hydrogensulfate, and processing the substrate for information record media. Therefore, the deterioration (YAKE etc.) of a glass front face and generating of a foreign matter resulting from migration on the front face of alkali-metal ion can be controlled remarkably. It can process to homogeneity continuously especially by compensating processing liquid with moisture by this invention for a long period of time, moisture evaporating, the crystal of pyrosulfate depositing, and the effectiveness of processing not falling, and maintaining the effectiveness of processing. Moreover, elution can be stopped about other leached moieties, such as an alkaline earth, and Si, Pb. Consequently, waterproof, acid-proof improvement can be aimed at.

[0034] Moreover, since the glass substrate which stopped the elution of the component of alkali or others remarkably is used according to the information record medium of this invention, the information record medium which is excellent in weatherability

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and a life and has high dependability can be manufactured.

[0035] Furthermore, since the product which stopped the elution of the component of alkali or others remarkably is obtained according to the glassware and its manufacture approach of this invention, the glassware which is excellent in weatherability and a life and has high dependability is obtained.

[0036]

[Embodiment of the Invention] Hereafter, this invention is explained in a detail.

[0037] In the manufacture approach of the substrate for information record media of this invention, the substrate which used the glass for information record media as the principal component is contacted to the fused salt which contains a hydrogensulfate and/or pyrosulfate at least, and in case processing which controls the elution of a glass component is performed, it is characterized by performing processing which controls crystallization of fused salt.

[0038] Here, as processing which controls crystallization of fused salt, although what kind of means may be adopted, the approach (the case where moisture is supplied positively is included irrespective of the moisture content contained in fused salt from a basis) of supplying moisture, or the approach of compensating the moisture lost from fused salt is mentioned to fused salt, for example. As processing which controls crystallization of fused salt, there are an approach of preventing moisture evaporating by vapor pressure or the pressure, the approach of sealing a processing tub, etc. as approaches other than the approach of supplying or compensating moisture. In addition, since it is necessary to exhaust SO_x which many costs start and is generated from fused salt in order to seal the perimeter of a processing tub when adopting the approach of suppressing the evaporation from fused salt, while covering the perimeter of a processing tub in a closed space, humidifying this closed space and supplying moisture, cautions are required.

[0039] Before the processing which controls crystallization of fused salt contacts a substrate and fused salt, it may be performed by whichever of the midst currently contacted. Moreover, processing liquid can be circulated outside from a processing tub, processing which controls crystallization of fused salt externally can be performed, and the system by which the processing liquid with which crystallization was prevented flows can also be adopted as a processing tub.

[0040] More specifically, the following approaches are mentioned as the approach of supplying moisture to fused salt, or an approach of compensating with the moisture lost from fused salt.

[0041] In the first place, the approach of introducing a steam into fused salt is mentioned. What is necessary is to insert the blowdown nozzle of steam into fused salt in this case, to carry out bubbling of the steam generated by the well-known approach from the nozzle, and just to supply or compensate moisture. What is necessary is to heat the water 2 put into the well-closed container 1 for example, before and after 100 degrees C, and to heat the air which supplied air from the Ayr supply pipe 3, and became wet through the steam tubing 4 in the water in a well-closed container, for example, to generate the steam around 280 degrees C, to supply steam from the nozzle at the tip of the steam tubing 4 into the fused salt 6 in the processing tub 5, and just to supply or compensate moisture, as more specifically shown in drawing 1. As for the temperature of a steam, from a viewpoint of preventing the temperature of fused salt falling and crystallizing, near the temperature of fused salt is desirable.

[0042] The method of second putting fused salt on the bottom of a steam ambient atmosphere is mentioned. What is necessary is to inject steam toward fused salt 6, and just to supply or compensate moisture from the nozzle at the tip of the steam tubing 4 arranged in the upper part of fused salt 6, as shown in drawing 2 in this case.

[0043] The approach of third adding a hydrogensulfate, the hydrate of a hydrogensulfate, etc. to fused salt, and preventing crystallization of fused salt is mentioned. In this case, the capacity of fused salt increases.

[0044] Although the approach of supplying direct water is in fused salt as the other approaches, since a phreatic explosion will be caused if water is put in into hot fused salt in this case, after once lowering the temperature of fused salt to near ordinary temperature, putting in water and making it react slowly, it is necessary to carry out a temperature up again to processing temperature.

[0045] In this invention, pyrosulfate is a salt of a pyrosulfuric acid (H₂S₂O₇), and is a compound with disulfuric acid ion (S₂O₇), alkali metal, alkaline earth metal, other metals, ammonium, etc. It will become pyrosulfate if one-mol water can be taken from a two-mol hydrogensulfate. If a hydrogensulfate is dissolved and it is fused salt, water will be lost and it will become pyrosulfate. In this case, although water evaporates, the water which remains slightly in fused salt participates in the mechanism of alkali elution prevention.

[0046] As pyrosulfate, salts, such as alkali metal, alkaline earth metal, ammonium, zinc, a thallium (I), lead (II), iron (II), and uranyl, are mentioned. From viewpoints, such as safety, environmental protection, economical efficiency, and handling nature, a potassium pyrosulfate, sodium pyrosulfate, etc. are desirable. As a hydrogensulfate, salts, such as alkali metal (Li, Na, K, Rb, Cs), an alkaline earth metal (Mg, calcium, Sr, Ba), ammonium, a thallium, lead, vanadium, a bismuth, and a rhodium, are mentioned. From viewpoints, such as safety, a potassium hydrogensulfate, a sodium hydrogensulfate, etc. are desirable.

[0047] A kind independent can be used for a hydrogensulfate and/or pyrosulfate, respectively, and a hydrogensulfate and pyrosulfate can also be mixed and used for them. Moreover, two or more sorts of different salts can be mixed and used for a hydrogensulfate and/or pyrosulfate, respectively. In this case, a mixed rate can be adjusted suitably. Furthermore, other components can also be added to fused salt in the range which does not spoil the effectiveness of this invention.

[0048] Since pyrosulfate is obtained also by adding a sulfuric acid to a sulfate, it may add a sulfuric acid to a sulfate and may make pyrosulfate. Although the crystal of a sulfate deposits in fused salt with the alkali removed from glass if it processes in the long run with salts, such as a hydrogensulfate, the crystal of a sulfate can be returned to a hydrogensulfate and/or pyrosulfate by adding a sulfuric acid. Since a sulfuric acid does not cause trouble to the fused salt processing by a hydrogensulfate etc., before the crystal of a sulfate deposits, it may process [be / it / under / fused salt / adding].

[0049] It contains, also when contacting only one field of the substrate for information record media besides in the case of the substrate for information record media being immersed in fused salt, saying "making contact" fused salt to fused salt.

[0050] The temperature of fused salt should just be under the sublimation temperature of a salt that what is necessary is just the melting temperature of a salt, or beyond liquid phase temperature. Although it is not so much dependent on temperature in respect of the effectiveness which controls the elution of alkali, if 250-300 degrees C or more, since the elution of alkali will become zero or it will become close to zero, it is desirable. On the other hand, since it becomes a problem in the long-term dependability when surface hardness etc. falling, forming a record layer and considering as an information record medium by blue YAKE on the front face of glass, it is desirable to consider as 350 degrees C - 500 degrees C or less. 500 degrees C was made into the upper limit because disassembly of fused salt will tend to have taken place, if it exceeded 500 degrees C. In addition, when it takes into consideration that the chemical-strengthening layer of the glass by which the chemical strengthening was carried out disappears,

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and reinforcement falls according to the ion exchange, in the case of chemically strengthened glass, it is desirable to consider as 300 degrees C - 350 degrees C or less. The temperature of the above viewpoints to fused salt is melting temperature or liquid phase temperature -500 degree C, and it is desirable that it is under the sublimation temperature (preferably melting temperature or liquid phase temperature - 350 degrees C) of fused salt. About the glass which has not carried out a chemical strengthening, it is more desirable that it is 250 degrees C - 350 degrees C (still more preferably 270 degrees C - 350 degrees C), and it is [glass / which carried out the chemical strengthening] more desirable that it is 250 degrees C - 300 degrees C (still more preferably 270 degrees C - 300 degrees C). In addition, although it is 325 degrees C (reference value), since the part absorbs moisture and generally serves as a hydrogensulfate, the melting point of pyrosulfuric-acid potash has at least 210-300 degrees C in a melting condition. Thus, actual melting temperature may differ from the melting point. The melting point of a potassium hydrogensulfate is 210 degrees C. The melting point of a sodium hydrogensulfate is 185.7 degrees C.

[0051] In respect of the effectiveness which controls the elution of alkali, it does not depend for the processing time by fused salt on the processing time so much. For example, if it is about 5 minutes or more, even if it will lengthen the processing time, there is no big difference in the effectiveness which controls the elution of alkali. Since it is such, its about 1 - 30 minutes are desirable, and when the processing time by fused salt takes processing effectiveness, productivity, etc. into consideration, about 5 - 10 minutes is more desirable [the processing time].

[0052] In addition, the processing by fused salt, such as a hydrogensulfate, does not do damage to the substrate for information record media. Moreover, according to processing by fused salt, such as pyrosulfate, it is effective in removing contamination, such as iron powder, and effective in removing the deposit fused salt accompanying chemical-strengthening processing.

[0053] In this invention, the substrate (product which uses glass as a principal component) which uses glass as a principal component points out what consists of composite material of glass, amorphous glass, a glass ceramic, glass ceramics, glass, and a ceramic etc. As a glass substrate, the glass which makes SiO₂ a frame is common, and there are a thing containing alkali ion and a thing which does not contain alkali ion. Although glass ceramics have many things containing alkali ion when using as a substrate for information record media, there are some which do not contain alkali ion in glass ceramics. The size of the substrate for information record media, thickness, especially a configuration, etc. are not restricted.

[0054] As a glass substrate containing alkali ion, alumino silicate glass, high valence metal ion (for example, Ti, Y, etc.) content silicate glass (high Young's modulus glass), soda lime glass, soda aluminosilicate glass, aluminoborosilicate glass, a BOROSHIRKE toga lath, chain silicate glass, etc. are mentioned, for example. In addition, as for alumino silicate glass etc., it is desirable to carry out a chemical strengthening in order to raise shock resistance and vibratility-proof. However, in the case of the glass substrate containing the alkali ion which does not need a chemical strengthening, the chemical strengthening is unnecessary.

[0055] As alumino silicate glass, while containing 2.5-15 % of the weight of ZrO₂ as a principal component 2.6-75 % of the weight of SiO₂, 2O3:5 - 15 % of the weight of aluminum, Li₂O:4-10 % of the weight, and Na₂O:4-12 % of the weight. The glass for chemical strengthenings 0.5-2.0, and whose weight ratio of aluminum₂O₃/ZrO₂ the weight ratio of Na₂O/ZrO₂ is 0.4-2.5, Or 2:62 - 75 % of the weight of SiO₂, 2O3:5 - 15 % of the weight of aluminum, The glass for chemical strengthenings which contains 2O3:0.01 - 1.0 % of the weight of Sb(s) as a principal component is desirable B-2O3:0.5-5 % of the weight, Li₂O:4-10 % of the weight, Na₂O:4-12 % of the weight, MgO:0.5-5 % of the weight, and CaO:0.5-5 % of the weight. Moreover, in order for the non-melt of ZrO₂ to lose the projection on the front face of a glass substrate produced owing to, it is desirable to use the glass for chemical strengthenings which contains aluminum 2O3 for ZrO₂ 0 to 2.8% 57 to 74%, and contains [SiO₂] Na₂O for Li₂O 4 to 14% 7 to 16% 3 to 15% by a mol % displays. Such alumino silicate glass of a presentation is excellent in anti-chip box reinforcement and thermal resistance while being able to control three persons of the depth of compressive stress, tensile stress, and a compressive-stress layer with sufficient balance by carrying out a chemical strengthening, it maintains surface smoothness while there are few deposits of Na etc., even if it is under hot environments, and it is excellent also in Knoop hardness.

[0056] As a crystallization glass substrate, there are glass ceramics which have a 2 silicic-acid lithium (Li₂O and 2SiO₂) and alpha quartz watch (SiO₂) as a main crystal phase, glass which has a potassium FURORIHITE light (KNaCaMg₅Si₈O₂₂F₂) and a potassium umbrella night (K₃Na₃calcium₅Si₁₂O₃₀F₄) as a main crystal phase. In the case of the former, as a concrete presentation 2:60 - 86 % of the weight of SiO₂, Li₂O: 8-18 % of the weight, K₂O:0-10 % of the weight, MgO:0-8 % of the weight, ZnO: 0-10 % of the weight and 2O3:0 - 2 % of the weight [of Sb(s)] P 2O5:0.1 - 10 % of the weight. In the case of the latter, 2O3:0 - 10 % of the weight of aluminum etc. is mentioned 2:50 - 75 % of the weight of SiO₂, CaO:4-15 % of the weight, MgO:5-30 % of the weight, F:3 - 8 % of the weight, Na₂O:2-9 % of the weight, Li₂O:0-3 % of the weight, and BaO:0-2% of the weight.

[0057] In this invention, a glass substrate can be immersed in the heated chemical-strengthening processing liquid if needed, and processing by the fused salt mentioned above can be performed about the glass substrate which carried out the ion exchange of the ion of a glass substrate surface, and carried out the chemical strengthening with the ion in chemical-strengthening processing liquid. In addition, in case the glass substrate which performed chemical-strengthening processing is processed with the above-mentioned fused salt, it is more desirable than chemical-strengthening processing temperature to process preferably at 60 degrees C and still more desirable temperature low 80 degrees C at least 50 degrees C.

[0058] Here, as an ion-exchange method, although the low temperature form ion-exchange method, the high temperature form ion-exchange method, the surface crystallizing method, etc. are learned, it is desirable to use a low temperature form ion-exchange method from viewpoints, like that high intensity is easy to be obtained and there is no deformation. A low temperature form ion-exchange method is a temperature region below the transition temperature (T_g) of glass, and is the approach of permuting the alkali ion in glass by alkali ion with a larger ionic radius than it, making generate compressive stress strong against a glass surface by the increment in the volume of the ion-exchange section, and strengthening a glass front face.

[0059] Fused salt etc. is mentioned although the salt of ion, such as Cu, Ag, Rb, and Cs, was mixed as chemical-strengthening processing liquid in fused salt, such as a potassium nitrate (KNO₃), a sodium nitrate (NaNO₃), and potassium carbonate (K₂CO₃), the fused salt of the things (for example, KNO₃+NaNO₃, KNO₃+K₂CO₃, etc.) which mixed these salts, or these salts.

[0060] As for especially heating temperature, it is desirable from the viewpoint of a glass transition point that they are 350 degrees C - 500 degrees C and 350 more degrees C - 450 degrees C 350 degrees C - 650 degrees C. As for immersion time amount, it is desirable to consider as 1 hour - about 20 hours from a viewpoint of anti-chip box reinforcement and a compressive-stress layer. As for the thickness of the compressive-stress layer formed in a glass substrate surface, it is desirable to be referred to as about 60-300 micrometers from a viewpoint of raising shock resistance and vibratility-proof.

[0061] Before processing a glass substrate with fused salt (fused salt or chemical-strengthening processing liquid, such as a hydrogensulfate), in order to prevent the crack and check of a glass substrate in this invention, it is desirable to carry out the preheating of the glass substrate to 200-350 degrees C.

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[0062] It is desirable to process by holding a glass substrate by the end face in processing with fused salt or chemical-strengthening processing liquid, such as a hydrogensulfate. When this is held in a part of front face of a glass substrate, it is for avoiding that the part is no longer processed.

[0063] It is desirable to cool slowly to predetermined temperature so that a glass substrate may be pulled up from fused salt after processing with fused salt and/or chemical-strengthening processing liquid, such as a hydrogensulfate, and generating of heat distortion can be suppressed in this invention. Thus, by cooling slowly, the damage by heat distortion is avoidable. As for especially the rate that anneals a glass substrate, it is desirable that it is a part for part [for part 10 more degrees-C/for part / for 5 degrees-C/- / and 60 degrees-C/-] and 50-degree-C/by part [for 2 degrees-C/-] and 100-degree-C/.

[0064] It is desirable to quench a glass substrate at the rate which prevents crystallization of the fused salt which deposits in after the above-mentioned annealing (for example, a glass substrate front face) in this invention. Thus, if a glass substrate is quenched, the fused salt which deposits will become brittle and removal of fused salt will become easy in down stream processing and the washing processes by fused salt, such as a hydrogensulfate.

[0065] As for especially the rate that quenches a glass substrate, it is desirable that it is a part for part [for part 800 more degrees-C/for part / for 1200 degrees-C/- / and 300 degrees-C/-] and 400-degree-C/by part [for 1600 degrees-C/-] and 200-degree-C/. As for quenching of a glass substrate, it is preferably desirable from a viewpoint of a heat shock to carry out by contacting still more preferably 100 degrees C - 0 degree C to a 40 degrees C - 10 degrees C refrigerant. As for the time amount which contacts a glass substrate to a refrigerant, it is desirable from a viewpoint of the detergency of deposit fused salt that it is 10 minutes - about 60 minutes. As a refrigerant, blasting of air besides gas refrigerants, such as liquid cryogens, such as water, warm water, and a solution, nitrogen gas, a steam, and cooling air, etc. is mentioned.

[0066] In this invention, the front face of the glass substrate which performed chemical-strengthening processing, or the glass substrate which does not perform chemical-strengthening processing can be processed with fused salt, such as a hydrogensulfate, if needed. In addition, in case the glass substrate which performed chemical-strengthening processing is processed with the above-mentioned fused salt, it is more desirable than chemical-strengthening processing temperature to process preferably at 60 degrees C and still more desirable temperature low 80 degrees C at least 50 degrees C.

[0067] In this invention, well-known washing processing of washing by commercial cleaning agents (neutral detergent, a surface active agent, alkaline cleaning agent, etc.), scrub washing, pure-water washing, solvent cleaning, solvent steam seasoning, centrifugal separation desiccation, etc. can be performed after the process of the arbitration in a production process if needed. Moreover, heating and ultrasonic impression may be performed in each washing.

[0068] Supersonic waves may be any of the thing of the multifrequency number form oscillated in a certain frequency range, or the thing of the fixed cycle number form oscillated on a fixed frequency. Although a cleaning effect is so high that a frequency is low, since the damage given to a glass substrate also becomes large, it determines in consideration of these things.

[0069] Since the rate of drying is quick, the silverfish by desiccation cannot generate steam seasoning easily. As a solvent used for steam seasoning, isopropyl alcohol, chlorofluocarbon, an acetone, a methanol, ethanol, etc. are mentioned.

[0070] The manufacture approach of the substrate for information record media of above-mentioned this invention can be used also as the manufacture approach of the glass substrate for magnetic disks, the glass substrate for magneto-optic disks, and disk substrates for electron optics, such as an optical memory disk. Especially the substrate for information record media of this invention can be suitably used as a glass substrate used for the magnetic disk played with a magnetic-reluctance mold head. In detail, by using the good glass substrate of a surface state far compared with the former, when it considers as the magnetic disk for a magnetic-reluctance mold head or large-sized magnetic-reluctance mold heads, the defect which does not cause the bed crash resulting from the foreign matter by elution, YAKE, etc. of alkali, and originates in film, such as a magnetic layer, at elution, YAKE, etc. of alkali does not occur, and it does not necessarily become the cause of an error.

[0071] Furthermore, the art of this invention can be widely used for the application of the field which needs to prevent the elution of the constituents (alkali metal, alkaline earth metal, silicon, lead, etc.) of glass or the ceramics.

[0072] Next, the information record medium of this invention is explained. The information record medium of this invention is characterized by forming a record layer at least on the substrate for information record media obtained using this invention approach mentioned above. Here, a thing well-known as a record layer or other layers can be used.

[0073] In the information record medium of this invention, since the substrate for information record media which controlled elution, such as alkali ion, remarkably is used, the information record medium which is excellent in weatherability and a life and has high dependability is obtained.

[0074] Hereafter, a magnetic-recording medium is explained as an example of an information record medium. On the substrate for magnetic disks, a magnetic-recording medium carries out the laminating of a substrate layer, a magnetic layer, toothing stratification, a protective layer, the lubricating layer, etc. one by one, and usually manufactures them if needed.

[0075] The substrate layer in a magnetic-recording medium is suitably chosen according to a magnetic layer. As a substrate layer (a seed layer is included), the substrate layer which is chosen from non-magnetic metal, such as Cr, Mo, Ta, Ti, W, V, B, aluminum, and nickel, and which consists of an ingredient more than a kind at least is mentioned, for example. In the case of the magnetic layer which uses Co as a principal component, it is desirable that they are Cr simple substances from a viewpoint and Cr alloys, such as improvement in magnetic properties. Moreover, with a monolayer, a substrate layer cannot be restricted but can also be made into two or more layer structure which carried out the laminating of the layer the same or of a different kind. For example, multilayer substrate layers, such as Cr/Cr, Cr/CrMo, Cr/CrV, CrV/CrV, aluminum/Cr/CrMo, aluminum/Cr/Cr, NiAl/Cr, NiAl/CrMo, and NiAl/CrV, etc. are mentioned.

[0076] Especially the ingredient of a magnetic layer is not restricted.

[0077] Specifically as a magnetic layer, magnetic thin films, such as CoPt which uses Co as a principal component, CoCr, CoNi, CoNiCr, CoCrTa, CoPtCr, CoNiPt, CoNiCrPt, CoNiCrTa, CoCrPtTa, and CoCrPtSiO, are mentioned. moreover — the multilayer configurations (for example, CoPtCr/CrMo/CoPtCr, CoCrTaPt/CrMo/CoCrTaPt, etc.) which divided the magnetic layer by nonmagnetic membranes (for example, Cr, CrMo, CrV, etc.), and aimed at reduction of a noise — also carrying out — it is good.

[0078] The thing which made Co system alloy contain the oxide of Y, Si, rare earth elements, the impurity elements chosen from Hf, germanium, Sn, and Zn, or these impurity elements as a magnetic layer corresponding to a magnetic-reluctance mold head (MR head) or a large-sized magnetic-reluctance mold head (GMR head) is contained.

[0079] Moreover, as a magnetic layer, you may be a ferrite system besides the above, an iron-rare earth system, GURANYURA of the structure where magnetic particles, such as Fe, Co, FeCo, and CoNiPt, were distributed in the nonmagnetic membrane which consists of SiO₂, BN, etc., etc. Moreover, a magnetic layer may be which record format of an inside mold and a vertical type.

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[0080] Toothing stratification is prepared in order to control the irregularity on the front face of a medium. Neither the formation approach of toothing stratification nor especially an ingredient is restricted. Moreover, especially the formation location of toothing stratification is not restricted, either.

[0081] In the case of the magnetic-recording medium for non-contact mold recording method magnetic disk drives, this toothing stratification forms the irregularity resulting from the irregularity of toothing stratification in a medium front face, and of the irregularity on this front face of a medium, it prevents adsorption with the magnetic head and a magnetic-recording medium, and it is formed in order to raise CSS endurance.

[0082] In addition, in the case of the magnetic-recording medium for contact mold recording method magnetic disk drives, since it is desirable that a medium front face is flat as much as possible in order to avoid damage on the magnetic head or a magnetic-recording medium, it is not necessary to prepare toothing stratification.

[0083] As for the surface roughness of toothing stratification, it is desirable that it is $Ra=10-50 \text{ A}$. The more desirable range is $Ra=10-30 \text{ A}$.

[0084] When Ra is less than 10 A , since the magnetic-recording medium front face is evenly near, the magnetic head and a magnetic-recording medium adsorb, the head crash by adsorption is caused and fatal damage is received [the magnetic head and a magnetic-recording medium get damaged, or], it is not desirable. Moreover, when Ra exceeds 50 A , since glide height becomes large and the fall of recording density is caused, it is not desirable.

[0085] the quality of the material and the formation approach of toothing stratification — a ***** cage — especially, it is not restricted. As the quality of the material of toothing stratification, the oxide of metals and those alloys, such as aluminum, Ti, Cr, Ag, Nb, Ta, Bi, Si, Zr, Cu, Ce, Au, Sn, Pd, Sb, germanium, Mg, In, W, and Pb, or a these metals and an alloy, a nitride, and carbide can be used. formation is easy — etc. — it is desirable that it is the metal which uses aluminum, such as aluminum simple substance, aluminum alloy, Oxidation aluminum (aluminum $2O_3$ etc.), and Nitriding aluminum (AlN etc.), as a principal component from a viewpoint.

[0086] Toothing stratification is good also as continuous texture film, and may consist of island-like projections distributed discretely. As for the height of this island-like projection, it is desirable that it is $100-500 \text{ A}$, and it is more desirable that it is $100-300 \text{ A}$.

[0087] The surface roughness of the toothing stratification mentioned above and concavo-convex (projection) height are controllable by the quality of the material of toothing stratification and its presentation, heat treatment conditions, etc.

[0088] As other concavo-convex formation approaches, texture processing by mechanical polish, texture processing by chemical etching, texture processing by energy beam exposure, etc. are mentioned, and those approaches can also be combined.

[0089] As a protective layer, Cr film, Cr alloy film, the carbon film, the hydrogenation carbon film, the zirconia film, the silica film, etc. are mentioned, for example. These protective coats can be continuously formed with an inline type or a standing opposed type sputtering system with a substrate layer, a magnetic layer, etc. Moreover, these protective coats are good also as a multilayer configuration which may be a monolayer or consists of film the same or of a different kind.

[0090] It may change to the above-mentioned protective layer top or the above-mentioned protective layer, and other protective layers may be formed. For example, instead of the above-mentioned protective layer, a colloidal silica particle may be distributed and applied to the inside which diluted the tetra-alkoxy run with the solvent of an alcoholic system, it may calcinate to it further, and the silicon oxide (SiO_2) film may be formed in it. In this case, the function of both a protective layer and toothing stratification is achieved.

[0091] Although proposals various as a lubricating layer are made, generally, it applies to a medium front face with a dipping method (dip coating), a spin coat method, a spray method, etc., and if needed, it heat-treats and the fluid lubrication agent which consists of a perfluoro polyether (PFPE) etc. is formed.

[0092]

[Example] Hereafter, based on an example, this invention is explained still more concretely.

[0093] Example 1 [0094] (1) The disc-like glass substrate (0.25 inches in the outer diameter of 2.5 inches, the bore of 0.8 inches, thickness) which has a circular hole was prepared for the center section which consists of reserve valence metal ion content silicate glass (high Young's modulus glass) ($T_g: 600 \text{ degree C}$) of a glass substrate. In addition, as high valence metal ion content silicate glass, it was a mol % displays, and SiO_2 was used and the glass which contains CaO for MgO 6% 2%, and contains [Li_2O / 8% and Na_2O] ZrO_2 for TiO_2 2% 15% 19% was used for aluminum $2O_3$ 5% 43%.

[0095] (2) The chemical strengthening was given after washing a chemical-strengthening process, next the above-mentioned glass substrate. The chemical strengthening prepared the chemical-strengthening processing liquid which mixed the potassium nitrate (60%) and the sodium nitrate (40%), heated this chemical-strengthening processing liquid at 480 degrees C , was immersed for about 4 hours and performed the glass substrate [finishing / washing] by which the preheating was carried out to 300 degrees C . In order to carry out the chemical strengthening of the whole front face of a glass substrate in the case of this immersion, it carried out in the condition of having contained in the electrode holder so that two or more glass substrates might be held by the end face.

[0096] Thus, by carrying out immersion processing at chemical-strengthening processing liquid, the lithium ion of a glass substrate surface and sodium ion are permuted by the sodium ion in chemical-strengthening processing liquid, and potassium ion, respectively, and a glass substrate is strengthened. The thickness of the compressive-stress layer formed in the surface of a glass substrate was about $100-200 \text{ micrometers}$.

[0097] (3) Carry out sequential annealing of the glass substrate which finished cooling, acid treatment, and the washing process above-mentioned chemical strengthening for a start at the second annealing room. First, a glass substrate is pulled up from chemical-strengthening processing liquid, and it transports to the first annealing room currently heated by 300 degrees C , it holds for about 10 minutes in this, and a glass substrate is annealed at 300 degrees C . Subsequently, a glass substrate is transported to the second annealing room currently heated by 200 degrees C from the first annealing room, and a glass substrate is annealed from 300 degrees C to 200 degrees C . Thus, by dividing into two steps and cooling slowly, a glass substrate can be opened from the damage by heat distortion. Next, it was immersed in the 20-degree C tank, and the glass substrate which finished the above-mentioned annealing was quenched, and was maintained for about 20 minutes. To neutral detergent, neutral detergent, pure water, pure water, and each washing tub of IPA (isopropyl alcohol) and IPA (steam seasoning), sequential immersion was carried out and the glass substrate which finished the above-mentioned cooling process was washed. In addition, the supersonic wave (frequency of 40 kHz) was impressed to each washing tub.

[0098] (4) It processed by immersing a glass substrate in this using the fused salt of the potassium pyrosulfate of the down-

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stream-processing reagent chemicals by fused salt. Under the present circumstances, as shown in Table 3, 2 hours or after supplying for 4 hours, processing was performed for the steam (air: 2000cm³/min, steam:1 g/min (it computed from the decrement/time amount of water), steam temperature:280 degree C) to fused salt (samples 1 and 2). In addition, when a steam was not supplied to fused salt for a comparison (comparison sample 2), the sample was prepared also about the case (comparison sample 1) where processing by the fused salt of a potassium pyrosulfate is not performed. Temperature of fused salt was made into 300 degrees C, and immersion time amount was set as for 5 minutes.

[0099] After carrying out washing processing of the glass substrate after the above-mentioned processing, the elution test and the environmental test were carried out. The result is shown in Table 3. Table 3 shows that processing by the fused salt of a potassium pyrosulfate is effective.

[0100]

[Table 3]

(明種：高原子価イオン含有ガラス)

	処 理 方 法	溶出試験結果	環境試験結果	表面観察 結果
		Li, Na, Kの合計溶出量 ($\mu\text{mol/Disk}$)		
比較試料 1	K ₂ S ₂ O ₇ 処理なし	8.7	5 μm 程度のヤケが多数	○
比較試料 2	K ₂ S ₂ O ₇ 処理 (300℃、5分)	0.2	5 μm 程度のヤケなし	○
試料 1	水蒸気2時間供給後			
	K ₂ S ₂ O ₇ 処理 (300℃、5分)	0.2	5 μm 程度のヤケなし	○
試料 2	水蒸気4時間供給後			
	K ₂ S ₂ O ₇ 処理 (300℃、5分)	0.2	5 μm 程度のヤケなし	○

K₂S₂O₇液相温度:210℃

[0101] in addition, the inside of the ultrapure water with which the elution test heated the glass substrate at 80 degrees C — 24 hours — being immersed — a leached moiety — ion chromatography — a quantum — carrying out — the elution volume (mumol/Disk) of the alkali-metal ion per glass substrate — it asked. The environmental test left the glass substrate for one week under the heat-and-high-humidity environment of the temperature of 80 degrees C, and 80% of relative humidity, carried out microscope observation of the glass front face, and observed and evaluated the deposit of the chloride of the alkali by the elution of alkali etc.

[0102] Glass ceramics which have a 2 silicic-acid lithium (Li₂O and 2SiO₂) and alpha quartz watch (SiO₂) as a main crystal phase as example 2 glass substrate (2:76.0 % of the weight of SiO(s)) Li₂O: 9.7 % of the weight, Na₂O:1.0 % of the weight, K₂O:3.5 % of the weight, MgO: 1.5 % of the weight and 2O₃:3.5 % of the weight [of aluminum] P 2O₅:3.0 % of the weight, After heating the glass containing 2:1.5 % of the weight of TiO(s), and 2O₃:0.3 % of the weight of As(es) with about 4.0-degree-C programming rate for /and holding it at this formation temperature for 1.5 hours, what heated with about 2.0-degree-C programming rate for /, and was held at 815 degrees C for 2.5 hours was prepared. About this glass substrate, after performing washing processing, it processed with the fused salt of a potassium pyrosulfate, and the elution test and the environmental test were carried out like the example 1.

Moreover, it tested similarly about the sample which does not perform processing by the potassium pyrosulfate for a comparison. Those results are shown in Table 4.

[0103]

[Table 4]

(明種：結晶化ガラス)

	処 理 方 法	溶出試験結果	環境試験結果	表面観察 結果
		Li, Na, Kの合計溶出量 ($\mu\text{mol/Disk}$)		
比較試料 3	K ₂ S ₂ O ₇ 処理なし	4.8	5 μm 程度のヤケが密集	○
比較試料 4	水蒸気導入なし			
	K ₂ S ₂ O ₇ 処理 (250℃、5分)	0.1	5 μm 程度のヤケなし	○
試料 3	水蒸気2時間供給後			
	K ₂ S ₂ O ₇ 処理 (250℃、5分)	0.1	5 μm 程度のヤケなし	○
試料 4	水蒸気4時間供給後			
	K ₂ S ₂ O ₇ 処理 (250℃、5分)	0.1	5 μm 程度のヤケなし	○

K₂S₂O₇液相温度:210℃

[0104] Table 4 shows that processing by the fused salt of a potassium pyrosulfate is effective also about the ceramics containing alkali.

[0105] Glass ceramics which have a potassium FURORORHITE light and a potassium kana site as a main crystal phase as example 3 glass substrate (2:56.5 % of the weight of SiO(s)) MgO: 11.8 % of the weight, CaO:14.1 % of the weight, Na₂O:5.4 % of the weight,

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K2O: After heating the glass containing 8.7 % of the weight and F:5.5 % of the weight with about 4.0-degree-C programming rate for /and holding it at this formation temperature for 1.5 hours, what heated with about 2.0-degree-C programming rate for /, and was held at 840 degrees C for 2.5 hours was prepared. About this glass substrate, after performing washing processing, it processed with the fused salt of a potassium pyrosulfate, and the elution test and the environmental test were carried out like the example 1. Moreover, it tested similarly about the sample which does not perform processing by the potassium pyrosulfate for a comparison. Those results are shown in Table 5.

[0106]

[Table 5]

(銅種：結晶化ガラス)

	処 理 方 法	溶出試験結果	環境試験結果	表面観察 結果
		Li, Na, Kの合計溶出量 ($\mu\text{mol/Disk}$)		
比較試料 5	K2S2O7処理なし	1.7	5 μm 程度のヤケが密集	○
比較試料 6	水蒸気導入なし K2S2O7処理 (250℃、5分)	0.1	5 μm 程度のヤケなし	○
試料 5	水蒸気2時間供給後 K2S2O7処理 (250℃、5分)	0.1	5 μm 程度のヤケなし	○
試料 6	水蒸気4時間供給後 K2S2O7処理 (250℃、5分)	0.1	5 μm 程度のヤケなし	○

K2S2O7液相温度:210℃

[0107] The relation between the installation time of steam and crystal deposit time amount was investigated about K2S2O7110kg fused salt at 4320 degrees C of examples. The result is shown in Table 6.

[0108]

[Table 6]

条 件	結 晶 析 出	備 考
水蒸気導入なし	120時間後	
水蒸気導入3時間	220時間後	Air:2000 cm^3/min , Steam:1g/min
水蒸気導入(継続)	析出せず	Air:2000 cm^3/min , Steam:1g/min

[0109] When a steam was not introduced, the crystal deposited in 120 hours, but when a steam was introduced for 3 hours, the crystal deposited in 220 hours, and when a steam was continued and introduced, the crystal did not deposit.

[0110] The difference by the difference in the approach of compensating example 5 moisture was investigated. The result is shown in Table 7.

[0111]

[Table 7]

条 件	結 晶 析 出	備 考
KHSO4添加	72時間後	KHSO4 440g添加
水蒸気導入3時間	100時間後	Air:2000 cm^3/min , Steam:1g/min

[0112] In potassium-hydrogensulfate addition, time amount until it adds moisture when a crystal deposits, and then a crystal deposits was 72 hours after, and when a steam was introduced for 3 hours, it was 100 hours after. In addition, as for the crystal, in any case, it disappeared immediately by moisture addition.

[0113] The elution test and the environmental test were carried out like the example 1 except having used the fused salt of the sodium pyrosulfate of reagent chemicals, the fused salt of a potassium hydrogensulfate, or the fused salt of a sodium hydrogensulfate instead of the fused salt of example 6 potassium pyrosulfate. The result is shown in Table 8.

[0114]

[Table 8]

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(硝種：高原子価(TiO₂, Y₂O₃等)を含有したアルミノシリケートガラス)

	処 理 方 法	溶出試験結果	環境試験結果	表面観察 結果
		Li, Na, Kの合計溶出量 ($\mu\text{mol/Disk}$)		
試料 7	水蒸気 2 時間供給後 Na ₂ S ₂ O ₇ 処理 (300℃, 5分)	0.2	5 μm 以内のヤケなし	○
試料 8	水蒸気 4 時間供給後 Na ₂ S ₂ O ₇ 処理 (300℃, 5分)	0.2	5 μm 以内のヤケなし	○
試料 9	水蒸気 2 時間供給後 KHSO ₄ 処理 (300℃, 5分)	0.2	5 μm 以内のヤケなし	○
試料 10	水蒸気 4 時間供給後 KHSO ₄ 処理 (300℃, 5分)	0.2	5 μm 以内のヤケなし	○
試料 11	水蒸気 2 時間供給後 NaHSO ₄ 処理 (300℃, 5分)	0.2	5 μm 以内のヤケなし	○
試料 12	水蒸気 4 時間供給後 NaHSO ₄ 処理 (300℃, 5分)	0.2	5 μm 以内のヤケなし	○

Na₂S₂O₇液相温度: 190℃、KHSO₄液相温度: 210℃、NaHSO₄液相温度: 190℃

[0115] The elution test and the environmental test were carried out like the example 1 except having used the fused salt which mixed the potassium pyrosulfate of example 7 reagent chemicals, and the sodium pyrosulfate of reagent chemicals, or having used the fused salt which mixed the potassium hydrogensulfate of reagent chemicals, and the sodium hydrogensulfate of reagent chemicals. The result is shown in Table 9.

[0116]

[Table 9]

(硝種：高原子価イオン含有ガラス)

	処 理 方 法	溶出試験結果	環境試験結果	表面観察 結果
		Li, Na, Kの合計溶出量 ($\mu\text{mol/Disk}$)		
試料 13	水蒸気 2 時間供給後 Na ₂ S ₂ O ₇ ・K ₂ S ₂ O ₇ 処理 (300℃, 5分)	1.1	5 μm 以内のヤケなし	○
試料 14	水蒸気 4 時間供給後 Na ₂ S ₂ O ₇ ・K ₂ S ₂ O ₇ 処理 (300℃, 5分)	1.2	5 μm 以内のヤケなし	○
試料 15	水蒸気 2 時間供給後 NaHSO ₄ ・KHSO ₄ 処理 (300℃, 5分)	1.1	5 μm 以内のヤケなし	○
試料 16	水蒸気 4 時間供給後 NaHSO ₄ ・KHSO ₄ 処理 (300℃, 5分)	1.2	5 μm 以内のヤケなし	○

Na₂S₂O₇・K₂S₂O₇ = 50wt%: 50wt%、NaHSO₄・KHSO₄ = 50wt%: 50wt%

Na₂S₂O₇・K₂S₂O₇液相温度: 150℃、NaHSO₄・KHSO₄液相温度: 150℃

[0117] The elution test and the environmental test were carried out like the example 1 except having used the fused salt which becomes in addition so that a sulfuric acid may be set to 1:1 to example 8 potassium pyrosulfate by the weight ratio. The result is shown in Table 10.

[0118]

[Table 10]

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(硝種：高原子価イオン含有ガラス)

	処 理 方 法	溶出試験結果	環境試験結果	表面観察 結果
		Li, Na, Kの合計溶出量 ($\mu\text{mol/Disk}$)		
試料 1 7	水蒸気2時間供給後 K2S2O7+硫酸 処理 (300℃、5分)	0.2	5 μm 程度のヤケなし	○
試料 1 8	水蒸気4時間供給後 K2S2O7+硫酸 処理 (300℃、5分)	0.2	5 μm 程度のヤケなし	○

K2S2O7:硫酸=50wt%:50wt%

[0119] Instead of example 9 - 11 quantity valence metal ion content glass, it is alumino silicate glass (presentation: by mol % display). aluminum 2O3 0 to 2.8% for ZrO2 57 to 74% 3 - 15%, [SiO2] Na2O is used as a principal component for Li2O 4 to 14% 7 to 16%. Content, Tg:500 degree C, Chemical-strengthening processing: The elution test and the environmental test were carried out like the example 1 except having used soda lime glass (example 10), soda aluminosilicate glass (example 11), and the BOROSHIKE toga lath containing a heavy metal ion for 400 degrees C and 3 hours (example 9). Consequently, the same effectiveness as an example 1 was accepted. In addition, the result of an example 9 (alumino silicate glass) is shown in Table 11.

[0120]

[Table 11]

(硝種：アルミノシリケートガラス)

	処 理 方 法	溶出試験結果	環境試験結果	表面観察 結果
		Li, Na, Kの合計溶出量 ($\mu\text{mol/Disk}$)		
比較試料 7	K2S2O7処理なし	2.0	5 μm 程度のヤケが密集	○
比較試料 8	水蒸気導入なし K2S2O7処理 (250℃、5分)	0.1	5 μm 程度のヤケなし	○
比較試料 9	水蒸気導入なし K2S2O7処理 (300℃、5分)	0.0	5 μm 程度のヤケなし	○
試料 1 9	水蒸気2時間供給後 K2S2O7処理 (250℃、5分)	0.1	5 μm 程度のヤケなし	○
試料 2 0	水蒸気4時間供給後 K2S2O7処理 (250℃、5分)	0.1	5 μm 程度のヤケなし	○
試料 2 1	水蒸気2時間供給後 K2S2O7処理 (300℃、5分)	0.0	5 μm 程度のヤケなし	○
試料 2 2	水蒸気4時間供給後 K2S2O7処理 (300℃、5分)	0.0	5 μm 程度のヤケなし	○

K2S2O7液相温度:210℃

[0121] in addition, the above-mentioned example — most stress relaxation was not accepted in the substrate after fused salt processing of the examples 1, 6, 7, 8, and 9 which processed the substrate which carried out chemical-strengthening processing with fused salt one to 11 inside.

[0122] The substrate layer which consists of aluminum (50A of thickness)/Cr(1000A)/CrMo (100A), the magnetic layer which consists of CoPtCr(120A)/CrMo(50A)/CoPtCr (120A), and Cr (50A) protective layer were formed in both sides of the glass substrate for magnetic disks obtained in the example 12 examples 1-11 with the inline-type sputtering system.

[0123] By dipping the above-mentioned substrate in the organic silicon compound solution (mixed liquor of water, IPA, and a tetra-ethoxy silane) which distributed the silica particle (grain size of 100A), and calcinating it, the protective layer which consists of SiO2 was formed, DIP processing of this protective layer top was further carried out to the lubricant which consists of a perphloro polyether, the lubricating layer was formed, and the magnetic disk for MR heads was obtained.

[0124] When the glide test was carried out about the obtained magnetic disk, the hit or crash resulting from the foreign matter by deformation of a substrate, elution, YAKE of alkali, etc. were not accepted. Moreover, it has also checked that the defect had not occurred on film, such as a magnetic layer.

[0125] Moreover, when weatherability and a life were investigated, degradation or the defect of the magnetic film resulting from deterioration of a glass substrate front face etc. were not accepted.

[0126] The in-line-type sputtering system was used for both sides of the glass substrate for magnetic disks obtained in the example 13 examples 1-11, sequential membrane formation of Cr substrate layer, a CrMo substrate layer, a CoPtCr magnetic layer, and the C protective layer was carried out, and the magnetic disk was obtained. It was checked that it is the same as that of an

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example 12 about the above-mentioned magnetic disk.

[0127] The magnetic disk for thin film heads was obtained like the example 13 except having made the example 14 substrate layer into aluminum/Cr/Cr, and having set the magnetic layer to CoNiCrTa. It was checked that it is the same as that of an example 12 about the above-mentioned magnetic disk.

[0128] Although the desirable example was given above and this invention was explained, this invention is not necessarily limited to the above-mentioned example.

[0129] For example, the heating temperature of fused salt, such as pyrosulfate, a class, immersion time amount, etc. are not limited to the thing of an example, but according to demand quality level etc., are changed suitably and can be carried out. Moreover, a washing process can be carried out after the process of the arbitration in a production process if needed.

[0130]

[Effect of the Invention] It can process to homogeneity continuously for a long period of time, moisture evaporating, the crystal of pyrosulfate depositing, and the effectiveness of processing not falling by supplying or compensating processing liquid with moisture, and maintaining the effectiveness of processing by it being immersed in fused salt, such as a hydrogensulfate, and processing the substrate for information record media, according to this invention approach, while being able to stop elution, such as alkali, remarkably, as explained above.

[0131] Moreover, since the substrate for information record media which can control elution, such as alkali, remarkably is used according to the information record medium of this invention, the information record medium which is excellent in weatherability and a life and has high dependability can be manufactured.

[0132] Furthermore, since the product which stopped the elution of the component of alkali or others remarkably is obtained according to the glassware and its manufacture approach of this invention, the glassware which is excellent in weatherability and a life and has high dependability is obtained.

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TECHNICAL FIELD

[Field of the Invention] This invention relates to the manufacture approach of the substrate for information record media, an information record medium, etc.

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PRIOR ART

[Description of the Prior Art] In recent years, the glass substrate and ceramic substrate which are excellent in various properties as a substrate for information record media as compared with other ingredients attract attention. In detail, as a substrate for magnetic disks, although many aluminum substrates were used, with the request of the miniaturization of a magnetic disk, sheet-metal-izing, or the reduction in surfacing of the magnetic head, compared with an aluminum substrate, a miniaturization and sheet-metal-izing are easy, and since display flatness is high and the reduction in surfacing of the magnetic head etc. is easy, the rate using a glass substrate or a ceramic substrate has been increasing.

[0003] When using a glass substrate as a substrate for information record media, chemical-strengthening processing is performed to a glass substrate front face, and improvement in on the strength is aimed at in many cases in order to prevent that raise shock resistance and vibratility-proof and a substrate is damaged by the impact or vibration. It is based on the approach (ion-exchange method) of permuting the alkali ion in glass by alkali ion with a larger ionic radius than it, making generate compressive stress strong against a glass surface by the increment in the volume of the ion-exchange section, and strengthening a glass front face as chemical-strengthening processing, for example etc. in many cases. When performing a chemical strengthening using an ion-exchange method, it is necessary to use the glass substrate containing the principle top alkali ion. In addition, even if it does not perform chemical-strengthening processing, the glass types (for example, high valence glass etc.) which have predetermined reinforcement are also in the glass substrate for information record media containing alkali ion.

[0004] Since shock resistance and vibratility-proof improve by crystallization when using a ceramic (for example, glass ceramics) substrate as a substrate for information record media, chemical-strengthening processing is not usually needed.

[0005] When using glass and a ceramic substrate as a substrate for information record media, it is desirable for the elution of the alkali contained in glass or a ceramic substrate to pose a problem in many cases, and to stop the elution of alkali as much as possible. The elution of alkali poses a problem also about the glass substrate after ion exchange treatment.

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EFFECT OF THE INVENTION

[Effect of the Invention] It can process to homogeneity continuously for a long period of time, moisture evaporating, the crystal of pyrosulfate depositing, and the effectiveness of processing not falling by supplying or compensating processing liquid with moisture, and maintaining the effectiveness of processing by it being immersed in fused salt, such as a hydrogensulfate, and processing the substrate for information record media, according to this invention approach, while being able to stop elution, such as alkali, remarkably, as explained above.

[0131] Moreover, since the substrate for information record media which can control elution, such as alkali, remarkably is used according to the information record medium of this invention, the information record medium which is excellent in weatherability and a life and has high dependability can be manufactured.

[0132] Furthermore, since the product which stopped the elution of the component of alkali or others remarkably is obtained according to the glassware and its manufacture approach of this invention, the glassware which is excellent in weatherability and a life and has high dependability is obtained.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] Although the elution of alkali poses a problem when using glass and a ceramic substrate as a substrate for information record media as mentioned above, most techniques which control the elution of alkali by high RE ** RU are not developed.

[0007] This invention aims at offer of the manufacture approach of the substrate for information record media which can be continuously processed to homogeneity for a long period of time etc., maintaining the effectiveness of processing while it is made under the above-mentioned background and can control the elution of the alkali from a glass substrate, or other components by high RE ** RU.

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MEANS

[Means for Solving the Problem] By it being immersed in fused salt, such as a hydrogensulfate, and processing the glass substrate for information record media containing alkali ion, an applicant for this patent finds out that the elution of alkali can be stopped remarkably, and has already applied (Japanese Patent Application No. No. 365326 [nine to]). The reason (mechanism) which can control the elution of the alkali from a glass substrate by high RE ** RU here if it is immersed in fused salt, such as a hydrogensulfate, and a glass substrate is processed From the condition of Si-O-Na in the maximum surface layer of glass of not constructing a bridge, the hydronium ion and Na⁺ of Si-O-Na which are produced from the moisture contained in a hydrogensulfate carry out the ion exchange. It is thought that it is because it becomes a silanol group (Si-O-H), and a silanol group is dehydrated by the afterbaking and bridge formation-ization of Si-O-Si is made on a glass front face. Moisture evaporated, the crystal of pyrosulfate (for example, K₂S₂O₇) deposited, and this invention persons found out that the effectiveness of processing fell, when processing was continued with fused salt, such as a hydrogensulfate (for example, KHSO₄), as a result of repeating research further (for example, the reaction of 2KHSO₄ →K₂S₂O₇+H₂O** will occur, and KHSO₄ will be set to K₂S₂O₇). And it came to complete header this invention for the ability to process to homogeneity continuously by compensating processing liquid with moisture for a long period of time, maintaining the effectiveness of processing. Moreover, it found such effectiveness that it is not based on the class of glass or ceramic, for example, is also effective also about glass ceramics. Furthermore, it found out that elution could be stopped not only about alkali but about other leached moieties, such as an alkaline earth, and Si, Pb. The concrete data about elution depressor effect, such as an alkaline earth and Si, are shown in Table 1 and 2. Table 1 and 2 shows that processing by the fused salt of pyrosulfate and the fused salt of a hydrogensulfate is effective. in addition, the inside of the ultrapure water with which the elution test heated the glass substrate at 80 degrees C — 24 hours — being immersed — a leached moiety — ion chromatography — a quantum — carrying out — the elution volume (μmol/Disk) of the alkali-metal ion per glass substrate — it asked.

[0009]

[Table 1]

(例種：高原子価イオン含有ガラス)

処 理 方 法	溶出試験結果 (μmol/Disk)	
	S i	M g, C a
K ₂ S ₂ O ₇ 処理なし	10	3.3
K ₂ S ₂ O ₇ 処理 (300℃、5分)	4.4	1.5
水蒸気 2 時間供給後 K ₂ S ₂ O ₇ 処理 (300℃、5分)	4.4	1.5
水蒸気 4 時間供給後 K ₂ S ₂ O ₇ 処理 (300℃、5分)	4.4	1.5

K₂S₂O₇液相温度:210℃

[0010]

[Table 2]

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(硝種：高原子価イオン含有ガラス)

処 理 方 法	溶出試験結果 ($\mu\text{mol/Disk}$)	
	Si	Mg, Ca
KHSO ₄ 処理なし	10	3.3
KHSO ₄ 処理 (300℃、5分)	4.5	1.6
水蒸気2時間供給後 KHSO ₄ 処理 (300℃、5分)	4.5	1.6
水蒸気4時間供給後 KHSO ₄ 処理 (300℃、5分)	4.5	1.6

[0011] In addition, since not only the glass substrate for information record media but the alkali of a glass component causes YAKE of optical glass or glass tableware, an optical lens, prism, a light filter, optical waveguide, an optical module, an optical element and an optic, the glass for a display, the substrate glass for solar batteries, the substrate glass for semi-conductors, the substrate glass for image sensors, electronic parts, an imprint mask, the glass tableware of processing according to fused salt, such as a hydrogensulfate of the invention in this application, also when obtaining glassware with sufficient weatherability, etc. are effective.

[0012] In addition, the technique which performs dealkalinization on the front face of a substrate with wet to the bottom of existence of AlCl₃, or (NH₄) is performed in an official announcement patent official report (***** No. 503403 [11 to]) by sublimation of a sulfate like 2SO₄ is indicated. However, since processing temperature is as low as 100 degrees C when AlCl₃ is used, the processing time becomes long with 24 hours as it is also in an example. On the other hand, when sublimation of a sulfate performs dealkalinization, in order to have to make a sulfate into a gas, 450-580 degrees C and an elevated temperature are required like an example. Since the invention in this application carries out dealkalinization processing to it by contacting a sulfate as fused salt at the temperature which itself melts, it is comparatively low temperature (an example 250-300 degrees C), and processing in a short time for about 5 minutes is possible. Therefore, the glass of large Tg range, such as glass with low Tg temperature, can be processed, or since it is low temperature treatment, it has the merit of not causing deformation of a glass substrate. Specifically, Tg of a glass substrate can apply the invention in this application to the thing near 400 degree C. Since the problem of causing crash if a glass substrate deforms since spacing of the glass substrate for information record media and the magnetic head is 40-50nm arises, deformation of the glass in the glass substrate for information record media poses a big problem. Moreover, in a ***** No. 503403 [11 to] official report, although dealkalinization processing of the glass which carried out chemical-strengthening processing at 500 degrees C is carried out by 2(NH₄) SO₄ at 500 degrees C, if dealkalinization processing is carried out at the same temperature as chemical-strengthening processing, relaxation of stress will take place, the reinforcement of a glass substrate falls, and the fall of the glass substrate for information record media on the strength is caused. The invention in this application is carrying out dealkalinization processing to it at temperature lower 80-130 degrees C than chemical-strengthening processing, and since the processing time is also as short as 5 minutes, relaxation of stress hardly takes place. Moreover, even if it must process in the condition of having sealed and continuation operation is difficult, since it becomes a gas in sublimation of a sulfate, but it is not necessary to seal the invention in this application for a liquid, continuation operation is easy, and it carries out continuation operation in order to perform processing which controls crystallization of fused salt in case it is dealkalinization, it is possible to acquire the continuing effectiveness of dealkalinization.

[0013] This invention is considered as the following configurations.

[0014] (Configuration 1) The manufacture approach of the substrate for information record media characterized by performing processing which controls crystallization of fused salt in case processing which the substrate which used the glass for information record media as the principal component is contacted to the fused salt which contains a hydrogensulfate and/or pyrosulfate at least, and controls the elution of a glass component is performed.

[0015] (Configuration 2) The manufacture approach of the substrate for information record media the configuration 1 publication characterized by performing processing which is contacted to said fused salt and controls the elution of a glass component, and processing which controls crystallization of fused salt after chemical-strengthening processing of a glass substrate, and performing processing by said fused salt at temperature lower at least 50 degrees C than chemical-strengthening processing temperature.

[0016] (Configuration 3) The manufacture approach of the substrate for information record media the configuration 1 characterized by performing processing which is contacted to said fused salt and controls the elution of a glass component under at the sublimation temperature of this fused salt, or given in two.

[0017] (Configuration 4) The manufacture approach of the substrate for information record media the configuration 1 whose glass component which controls elution is characterized by being alkali ion thru/or given in either of 3.

[0018] (Configuration 5) The manufacture approach of the substrate for information record media the configuration 1 whose processing which controls crystallization of fused salt is characterized by being the processing which supplies moisture to fused salt thru/or given in either of 4.

[0019] (Configuration 6) The manufacture approach of the substrate for information record media the configuration 1 characterized by the processing which controls crystallization of fused salt being the processing with which the moisture lost from fused salt is compensated thru/or given in either of 5.

[0020] (Configuration 7) The manufacture approach of the substrate for information record media the configuration 1 characterized by the fused salt containing a hydrogensulfate and/or pyrosulfate being the fused salt which comes to add a sulfuric acid further thru/or given in either of 6.

[0021] (Configuration 8) The manufacture approach of the substrate for information record media the configuration 5 characterized

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by the approach of compensating the supply approach of moisture or moisture being the approach of introducing a steam into fused salt, or given in six.

[0022] (Configuration 9) The manufacture approach of the substrate for information record media the configuration 5 characterized by the approach of compensating the supply approach of moisture or moisture being an approach of putting fused salt on the bottom of a steam ambient atmosphere, or given in six.

[0023] (Configuration 10) The manufacture approach of the substrate for information record media the configuration 5 to which the approach of compensating the supply approach of moisture or moisture is characterized by being the approach of adding a hydrogensulfate to fused salt, or given in six.

[0024] (Configuration 11) The manufacture approach of the substrate for information record media the configuration 1 characterized by for the temperature of fused salt being melting temperature or liquid phase temperature -500 degree C, and being under the sublimation temperature of fused salt thru/or given in either of 10.

[0025] (Configuration 12) By the manufacture approach of the substrate for information record media a publication, to either a configuration 1 thru/or 11 publications The ion exchange of Na^+ of Si-O-Na is carried out to hydronium ion, and a glass front face will be in a hydration condition from the condition of Si-O-Na of not constructing a bridge. Then, the manufacture approach of the substrate for information record media characterized by changing into the condition that the silanol group was formed of heating dehydration, the silanol group was dehydrated, and bridge formation-ization of Si-O-Si was made on the glass front face by it.

[0026] (Configuration 13) The manufacture approach of the substrate for information record media characterized by changing a glass substrate front face into the condition that bridge formation-ization of Si-O-Si was made from the condition of Si-O-Na of not constructing a bridge, by the manufacture approach of the substrate for information record media given in either a configuration 1 thru/or 11 publications.

[0027] (Configuration 14) The manufacture approach of the substrate for information record media the configuration 1 characterized by the substrate for information record media being a glass substrate to which chemical-strengthening processing was performed thru/or given in either of 13.

[0028] (Configuration 15) The manufacture approach of the substrate for information record media the configuration 1 whose substrate for information record media is characterized by being a glass-ceramics substrate thru/or given in either of 13.

[0029] (Configuration 16) The manufacture approach of the substrate for information record media the configuration 1 characterized by the substrate for information record media being a substrate used for the magnetic disk played with a magnetic-reluctance mold head thru/or given in either of 15.

[0030] (Configuration 17) The information record medium characterized by forming a record layer at least on the substrate for information record media obtained by a configuration 1 thru/or either of 16 using the manufacture approach of the substrate for information record media a publication.

[0031] (Configuration 18) The manufacture approach of the glassware characterized by performing processing which controls crystallization of fused salt in case processing which the product which used glass as the principal component is contacted to the fused salt which contains a hydrogensulfate and/or pyrosulfate at least, and controls the elution of a glass component is performed.

[0032] (Configuration 19) The manufacture approach of glassware given in the configuration 18 characterized by performing processing which is contacted to said fused salt and controls the elution of a glass component under at the sublimation temperature of this fused salt.

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OPERATION

[Function] By this invention, the elution of alkali can be remarkably stopped by it being immersed in fused salt, such as a hydrogensulfate, and processing the substrate for information record media. Therefore, the deterioration (YAKE etc.) of a glass front face and generating of a foreign matter resulting from migration on the front face of alkali-metal ion can be controlled remarkably. It can process to homogeneity continuously especially by compensating processing liquid with moisture by this invention for a long period of time, moisture evaporating, the crystal of pyrosulfate depositing, and the effectiveness of processing not falling, and maintaining the effectiveness of processing. Moreover, elution can be stopped about other leached moieties, such as an alkaline earth, and Si, Pb. Consequently, waterproof, acid-proof improvement can be aimed at.

[0034] Moreover, since the glass substrate which stopped the elution of the component of alkali or others remarkably is used according to the information record medium of this invention, the information record medium which is excellent in weatherability and a life and has high dependability can be manufactured.

[0035] Furthermore, since the product which stopped the elution of the component of alkali or others remarkably is obtained according to the glassware and its manufacture approach of this invention, the glassware which is excellent in weatherability and a life and has high dependability is obtained.

[0036]

[Embodiment of the Invention] Hereafter, this invention is explained to a detail.

[0037] In the manufacture approach of the substrate for information record media of this invention, the substrate which used the glass for information record media as the principal component is contacted to the fused salt which contains a hydrogensulfate and/or pyrosulfate at least, and in case processing which controls the elution of a glass component is performed, it is characterized by performing processing which controls crystallization of fused salt.

[0038] Here, as processing which controls crystallization of fused salt, although what kind of means may be adopted, the approach (the case where moisture is supplied positively is included irrespective of the moisture content contained in fused salt from a basis) of supplying moisture, or the approach of compensating the moisture lost from fused salt is mentioned to fused salt, for example. As processing which controls crystallization of fused salt, there are an approach of preventing moisture evaporating by vapor pressure or the pressure, the approach of sealing a processing tub, etc. as approaches other than the approach of supplying or compensating moisture. In addition, since it is necessary to exhaust SOx which many costs start and is generated from fused salt in order to seal the perimeter of a processing tub when adopting the approach of suppressing the evaporation from fused salt, while covering the perimeter of a processing tub in a closed space, humidifying this closed space and supplying moisture, cautions are required.

[0039] Before the processing which controls crystallization of fused salt contacts a substrate and fused salt, it may be performed by whichever of the midst currently contacted. Moreover, processing liquid can be circulated outside from a processing tub, processing which controls crystallization of fused salt externally can be performed, and the system by which the processing liquid with which crystallization was prevented flows can also be adopted as a processing tub.

[0040] More specifically, the following approaches are mentioned as the approach of supplying moisture to fused salt, or an approach of compensating with the moisture lost from fused salt.

[0041] In the first place, the approach of introducing a steam into fused salt is mentioned. What is necessary is to insert the blowdown nozzle of steam into fused salt in this case, to carry out bubbling of the steam generated by the well-known approach from the nozzle, and just to supply or compensate moisture. What is necessary is to heat the water 2 put into the well-closed container 1 for example, before and after 100 degrees C, and to heat the air which supplied air from the Ayr supply pipe 3, and became wet through the steam tubing 4 in the water in a well-closed container, for example, to generate the steam around 280 degrees C, to supply steam from the nozzle at the tip of the steam tubing 4 into the fused salt 6 in the processing tub 5, and just to supply or compensate moisture, as more specifically shown in drawing 1. As for the temperature of a steam, from a viewpoint of preventing the temperature of fused salt falling and crystallizing, near the temperature of fused salt is desirable.

[0042] The method of second putting fused salt on the bottom of a steam ambient atmosphere is mentioned. What is necessary is to inject steam toward fused salt 6, and just to supply or compensate moisture from the nozzle at the tip of the steam tubing 4 arranged in the upper part of fused salt 6, as shown in drawing 2 in this case.

[0043] The approach of third adding a hydrogensulfate, the hydrate of a hydrogensulfate, etc. to fused salt, and preventing crystallization of fused salt is mentioned. In this case, the capacity of fused salt increases.

[0044] Although the approach of supplying direct water is in fused salt as the other approaches, since a phreatic explosion will be caused if water is put in into hot fused salt in this case, after once lowering the temperature of fused salt to near ordinary temperature, putting in water and making it react slowly, it is necessary to carry out a temperature up again to processing temperature.

[0045] In this invention, pyrosulfate is a salt of a pyrosulfuric acid (H₂S₂O₇), and is a compound with disulfuric acid ion (S₂O₇), alkali metal, alkaline earth metal, other metals, ammonium, etc. It will become pyrosulfate if one-mol water can be taken from a two-mol hydrogensulfate. If a hydrogensulfate is dissolved and it is fused salt, water will be lost and it will become pyrosulfate. In this case, although water evaporates, the water which remains slightly in fused salt participates in the mechanism of alkali elution prevention.

[0046] As pyrosulfate, salts, such as alkali metal, alkaline earth metal, ammonium, zinc, a thallium (I), lead (II), iron (II), and uranyl, are mentioned. From viewpoints, such as safety, environmental protection, economical efficiency, and handling nature, a potassium

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pyrosulfate, sodium pyrosulfate, etc. are desirable. As a hydrogensulfate, salts, such as alkali metal (Li, Na, K, Rb, Cs), an alkaline earth metal (Mg, calcium, Sr, Ba), ammonium, a thallium, lead, vanadium, a bismuth, and a rhodium, are mentioned. From viewpoints, such as safety, a potassium hydrogensulfate, a sodium hydrogensulfate, etc. are desirable.

[0047] A kind independent can be used for a hydrogensulfate and/or pyrosulfate, respectively, and a hydrogensulfate and pyrosulfate can also be mixed and used for them. Moreover, two or more sorts of different salts can be mixed and used for a hydrogensulfate and/or pyrosulfate, respectively. In this case, a mixed rate can be adjusted suitably. Furthermore, other components can also be added to fused salt in the range which does not spoil the effectiveness of this invention.

[0048] Since pyrosulfate is obtained also by adding a sulfuric acid to a sulfate, it may add a sulfuric acid to a sulfate and may make pyrosulfate. Although the crystal of a sulfate deposits in fused salt with the alkali removed from glass if it processes in the long run with salts, such as a hydrogensulfate, the crystal of a sulfate can be returned to a hydrogensulfate and/or pyrosulfate by adding a sulfuric acid. Since a sulfuric acid does not cause trouble to the fused salt processing by a hydrogensulfate etc., before the crystal of a sulfate deposits, it may process [be / it / under / fused salt / adding].

[0049] It contains, also when contacting only one field of the substrate for information record media besides in the case of the substrate for information record media being immersed in fused salt, saying "making contact" fused salt to fused salt.

[0050] The temperature of fused salt should just be under the sublimation temperature of a salt that what is necessary is just the melting temperature of a salt, or beyond liquid phase temperature. Although it is not so much dependent on temperature in respect of the effectiveness which controls the elution of alkali, if 250–300 degrees C or more, since the elution of alkali will become zero or it will become close to zero, it is desirable. On the other hand, since it becomes a problem in the long-term dependability when surface hardness etc. falling, forming a record layer and considering as an information record medium by blue YAKE on the front face of glass, it is desirable to consider as 350 degrees C – 500 degrees C or less. 500 degrees C was made into the upper limit because disassembly of fused salt will tend to have taken place, if it exceeded 500 degrees C. In addition, when it takes into consideration that the chemical-strengthening layer of the glass by which the chemical strengthening was carried out disappears, and reinforcement falls according to the ion exchange, in the case of chemically strengthened glass, it is desirable to consider as 300 degrees C – 350 degrees C or less. The temperature of the above viewpoints to fused salt is melting temperature or liquid phase temperature – 500 degree C, and it is desirable that it is under the sublimation temperature (preferably melting temperature or liquid phase temperature – 350 degrees C) of fused salt. About the glass which has not carried out a chemical strengthening, it is more desirable that it is 250 degrees C – 350 degrees C (still more preferably 270 degrees C – 350 degrees C), and it is [glass / which carried out the chemical strengthening] more desirable that it is 250 degrees C – 300 degrees C (still more preferably 270 degrees C – 300 degrees C). In addition, although it is 325 degrees C (reference value), since the part absorbs moisture and generally serves as a hydrogensulfate, the melting point of pyrosulfuric-acid potash has at least 210–300 degrees C in a melting condition. Thus, actual melting temperature may differ from the melting point. The melting point of a potassium hydrogensulfate is 210 degrees C. The melting point of a sodium hydrogensulfate is 185.7 degrees C.

[0051] In respect of the effectiveness which controls the elution of alkali, it does not depend for the processing time by fused salt on the processing time so much. For example, if it is about 5 minutes or more, even if it will lengthen the processing time, there is no big difference in the effectiveness which controls the elution of alkali. Since it is such, its about 1 – 30 minutes are desirable, and when the processing time by fused salt takes processing effectiveness, productivity, etc. into consideration, about 5 – 10 minutes is more desirable [the processing time].

[0052] In addition, the processing by fused salt, such as a hydrogensulfate, does not do damage to the substrate for information record media. Moreover, according to processing by fused salt, such as pyrosulfate, it is effective in removing contamination, such as iron powder, and effective in removing the deposit fused salt accompanying chemical-strengthening processing.

[0053] In this invention, the substrate (product which uses glass as a principal component) which uses glass as a principal component points out what consists of composite material of glass, amorphous glass, a glass ceramic, glass ceramics, glass, and a ceramic etc. As a glass substrate, the glass which makes SiO₂ a frame is common, and there are a thing containing alkali ion and a thing which does not contain alkali ion. Although glass ceramics have many things containing alkali ion when using as a substrate for information record media, there are some which do not contain alkali ion in glass ceramics. The size of the substrate for information record media, thickness, especially a configuration, etc. are not restricted.

[0054] As a glass substrate containing alkali ion, aluminosilicate glass, high valence metal ion (for example, Ti, Y, etc.) content silicate glass (high Young's modulus glass), soda lime glass, soda aluminosilicate glass, aluminoborosilicate glass, a BOROSHIRIKE toga lath, chain silicate glass, etc. are mentioned, for example. In addition, as for aluminosilicate glass etc., it is desirable to carry out a chemical strengthening in order to raise shock resistance and vibratility-proof. However, in the case of the glass substrate containing the alkali ion which does not need a chemical strengthening, the chemical strengthening is unnecessary.

[0055] As aluminosilicate glass, while containing 2.5 – 15 % of the weight of ZrO₂ as a principal component 2:62 – 75 % of the weight of SiO₂, 2O₃:5 – 15 % of the weight of aluminum, Li₂O:4–10 % of the weight, and Na₂O:4–12 % of the weight. The glass for chemical strengthenings 0.5–2.0, and whose weight ratio of aluminum₂O₃/ZrO₂ the weight ratio of Na₂O/ZrO₂ is 0.4–2.5, Or 2:62 – 75 % of the weight of SiO₂, 2O₃:5 – 15 % of the weight of aluminum. The glass for chemical strengthenings which contains 2O₃:0.01 – 1.0 % of the weight of Sb(s) as a principal component is desirable B–2O₃:0.5–5 % of the weight, Li₂O:4–10 % of the weight, Na₂O:4–12 % of the weight, MgO:0.5–5 % of the weight, and CaO:0.5–5 % of the weight. Moreover, in order for the non-melt of ZrO₂ to lose the projection on the front face of a glass substrate produced owing to, it is desirable to use the glass for chemical strengthenings which contains aluminum 2O₃ for ZrO₂ 0 to 2.8% 57 to 74%, and contains [SiO₂] Na₂O for Li₂O 4 to 14% 7 to 16% 3 to 15% by a mol % displays. Such aluminosilicate glass of a presentation is excellent in anti-chip box reinforcement and thermal resistance while being able to control three persons of the depth of compressive stress, tensile stress, and a compressive-stress layer with sufficient balance by carrying out a chemical strengthening, it maintains surface smoothness while there are few deposits of Na etc., even if it is under hot environments, and it is excellent also in Knoop hardness.

[0056] As a crystallization glass substrate, there are glass ceramics which have a 2 silicic-acid lithium (Li₂O and 2SiO₂) and alpha quartz watch (SiO₂) as a main crystal phase, glass which has a potassium FURORIRHITE light (KNaCaMg₅Si₈O₂₂F₂) and a potassium umbrella night (K₃Na₃calcium₅Si₁₂O₃₀F₄) as a main crystal phase. In the case of the former, as a concrete presentation 2:60 – 86 % of the weight of SiO₂, Li₂O: 8–18 % of the weight, K₂O:0–10 % of the weight, MgO:0–8 % of the weight, ZnO: 0–10 % of the weight and 2O₃:0 – 2 % of the weight [of Sb(s)] P 2O₅:0.1 – 10 % of the weight. In the case of the latter, 2O₃:0 – 10 % of the weight of aluminum etc. is mentioned 2:50 – 75 % of the weight of SiO₂, CaO:4–15 % of the weight, MgO:5–30 % of the weight, F:3 – 8 % of the weight, Na₂O:2–9 % of the weight, Li₂O:0–3 % of the weight, and BaO:0–2 % of the weight.

[0057] In this invention, a glass substrate can be immersed in the heated chemical-strengthening processing liquid if needed, and

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processing by the fused salt mentioned above can be performed about the glass substrate which carried out the ion exchange of the ion of a glass substrate surface, and carried out the chemical strengthening with the ion in chemical-strengthening processing liquid. In addition, in case the glass substrate which performed chemical-strengthening processing is processed with the above-mentioned fused salt, it is more desirable than chemical-strengthening processing temperature to process preferably at 60 degrees C and still more desirable temperature low 80 degrees C at least 50 degrees C.

[0058] Here, as an ion-exchange method, although the low temperature form ion-exchange method, the high temperature form ion-exchange method, the surface crystallizing method, etc. are learned, it is desirable to use a low temperature form ion-exchange method from viewpoints, like that high intensity is easy to be obtained and there is no deformation. A low temperature form ion-exchange method is a temperature region below the transition temperature (T_g) of glass, and is the approach of permuting the alkali ion in glass by alkali ion with a larger ionic radius than it, making generate compressive stress strong against a glass surface by the increment in the volume of the ion-exchange section, and strengthening a glass front face.

[0059] Fused salt etc. is mentioned although the salt of ion, such as Cu, Ag, Rb, and Cs, was mixed as chemical-strengthening processing liquid in fused salt, such as a potassium nitrate (KNO₃), a sodium nitrate (NaNO₃), and potassium carbonate (K₂CO₃), the fused salt of the things (for example, KNO₃+NaNO₃, KNO₃+K₂CO₃, etc.) which mixed these salts, or these salts.

[0060] As for especially heating temperature, it is desirable from the viewpoint of a glass transition point that they are 350 degrees C - 500 degrees C and 350 more degrees C - 450 degrees C 350 degrees C - 650 degrees C. As for immersion time amount, it is desirable to consider as 1 hour - about 20 hours from a viewpoint of anti-chip box reinforcement and a compressive-stress layer. As for the thickness of the compressive-stress layer formed in a glass substrate surface, it is desirable to be referred to as about 60-300 micrometers from a viewpoint of raising shock resistance and vibratility-proof.

[0061] Before processing a glass substrate with fused salt (fused salt or chemical-strengthening processing liquid, such as a hydrogensulfate), in order to prevent the crack and check of a glass substrate in this invention, it is desirable to carry out the preheating of the glass substrate to 200-350 degrees C.

[0062] It is desirable to process by holding a glass substrate by the end face in processing with fused salt or chemical-strengthening processing liquid, such as a hydrogensulfate. When this is held in a part of front face of a glass substrate, it is for avoiding that the part is no longer processed.

[0063] It is desirable to cool slowly to predetermined temperature so that a glass substrate may be pulled up from fused salt after processing with fused salt and/or chemical-strengthening processing liquid, such as a hydrogensulfate, and generating of heat distortion can be suppressed in this invention. Thus, by cooling slowly, the damage by heat distortion is avoidable. As for especially the rate that anneals a glass substrate, it is desirable that it is a part for part [for part 10 more degrees-C/for part / for 5 degrees-C/- / and 60 degrees-C/-] and 50-degree-C/by part [for 2 degrees-C/-] and 100-degree-C/.

[0064] It is desirable to quench a glass substrate at the rate which prevents crystallization of the fused salt which deposits in after the above-mentioned annealing (for example, a glass substrate front face) in this invention. Thus, if a glass substrate is quenched, the fused salt which deposits will become brittle and removal of fused salt will become easy in down stream processing and the washing processes by fused salt, such as a hydrogensulfate.

[0065] As for especially the rate that quenches a glass substrate, it is desirable that it is a part for part [for part 800 more degrees-C/for part / for 1200 degrees-C/- / and 300 degrees-C/-] and 400-degree-C/by part [for 1600 degrees-C/-] and 200-degree-C/. As for quenching of a glass substrate, it is preferably desirable from a viewpoint of a heat shock to carry out by contacting still more preferably 100 degrees C - 0 degree C to a 40 degrees C - 10 degrees C refrigerant. As for the time amount which contacts a glass substrate to a refrigerant, it is desirable from a viewpoint of the detergency of deposit fused salt that it is 10 minutes - about 60 minutes. As a refrigerant, blasting of air besides gas refrigerants, such as liquid cryogens, such as water, warm water, and a solution, nitrogen gas, a steam, and cooling air, etc. is mentioned.

[0066] In this invention, the front face of the glass substrate which performed chemical-strengthening processing, or the glass substrate which does not perform chemical-strengthening processing can be processed with fused salt, such as a hydrogensulfate, if needed. In addition, in case the glass substrate which performed chemical-strengthening processing is processed with the above-mentioned fused salt, it is more desirable than chemical-strengthening processing temperature to process preferably at 60 degrees C and still more desirable temperature low 80 degrees C at least 50 degrees C.

[0067] In this invention, well-known washing processing of washing by commercial cleaning agents (neutral detergent, a surface active agent, alkaline cleaning agent, etc.), scrub washing, pure-water washing, solvent cleaning, solvent steam seasoning, centrifugal separation desiccation, etc. can be performed after the process of the arbitration in a production process if needed. Moreover, heating and ultrasonic impression may be performed in each washing.

[0068] Supersonic waves may be any of the thing of the multifrequency number form oscillated in a certain frequency range, or the thing of the fixed cycle number form oscillated on a fixed frequency. Although a cleaning effect is so high that a frequency is low, since the damage given to a glass substrate also becomes large, it determines in consideration of these things.

[0069] Since the rate of drying is quick, the silverfish by desiccation cannot generate steam seasoning easily. As a solvent used for steam seasoning, isopropyl alcohol, chlorofluorocarbon, an acetone, a methanol, ethanol, etc. are mentioned.

[0070] The manufacture approach of the substrate for information record media of above-mentioned this invention can be used also as the manufacture approach of the glass substrate for magnetic disks, the glass substrate for magneto-optic disks, and disk substrates for electron optics, such as an optical memory disk. Especially the substrate for information record media of this invention can be suitably used as a glass substrate used for the magnetic disk played with a magnetic-reluctance mold head. In detail, by using the good glass substrate of a surface state far compared with the former, when it considers as the magnetic disk for a magnetic-reluctance mold head or large-sized magnetic-reluctance mold heads, the defect which does not cause the bed crash resulting from the foreign matter by elution, YAKE, etc. of alkali, and originates in film, such as a magnetic layer, at elution, YAKE, etc. of alkali does not occur, and it does not necessarily become the cause of an error.

[0071] Furthermore, the art of this invention can be widely used for the application of the field which needs to prevent the elution of the constituents (alkali metal, alkaline earth metal, silicon, lead, etc.) of glass or the ceramics.

[0072] Next, the information record medium of this invention is explained. The information record medium of this invention is characterized by forming a record layer at least on the substrate for information record media obtained using this invention approach mentioned above. Here, a thing well-known as a record layer or other layers can be used.

[0073] In the information record medium of this invention, since the substrate for information record media which controlled elution, such as alkali ion, remarkably is used, the information record medium which is excellent in weatherability and a life and has high dependability is obtained.

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[0074] Hereafter, a magnetic-recording medium is explained as an example of an information record medium. On the substrate for magnetic disks, a magnetic-recording medium carries out the laminating of a substrate layer, a magnetic layer, toothing stratification, a protective layer, the lubricating layer, etc. one by one, and usually manufactures them if needed.

[0075] The substrate layer in a magnetic-recording medium is suitably chosen according to a magnetic layer. As a substrate layer (a seed layer is included), the substrate layer which is chosen from non-magnetic metal, such as Cr, Mo, Ta, Ti, W, V, B, aluminum, and nickel, and which consists of an ingredient more than a kind at least is mentioned, for example. In the case of the magnetic layer which uses Co as a principal component, it is desirable that they are Cr simple substances from a viewpoint and Cr alloys, such as improvement in magnetic properties. Moreover, with a monolayer, a substrate layer cannot be restricted but can also be made into two or more layer structure which carried out the laminating of the layer the same or of a different kind. For example, multilayer substrate layers, such as Cr/Cr, Cr/CrMo, Cr/CrV, CrV/CrV, aluminum/Cr/CrMo, aluminum/Cr/Cr, NiAl/Cr, NiAl/CrMo, and NiAl/CrV, etc. are mentioned.

[0076] Especially the ingredient of a magnetic layer is not restricted.

[0077] Specifically as a magnetic layer, magnetic thin films, such as CoPt which uses Co as a principal component, CoCr, CoNi, CoNiCr, CoCrTa, CoPtCr, CoNiPt, CoNiCrPt, CoNiCrTa, CoCrPtTa, and CoCrPtSiO₂, are mentioned. moreover — the multilayer configurations (for example, CoPtCr/CrMo/CoPtCr, CoCrTaPt/CrMo/CoCrTaPt, etc.) which divided the magnetic layer by nonmagnetic membranes (for example, Cr, CrMo, CrV, etc.), and aimed at reduction of a noise — also carrying out — it is good.

[0078] The thing which made Co system alloy contain the oxide of Y, Si, rare earth elements, the impurity elements chosen from Hf, germanium, Sn, and Zn, or these impurity elements as a magnetic layer corresponding to a magnetic-reluctance mold head (MR head) or a large-sized magnetic-reluctance mold head (GMR head) is contained.

[0079] Moreover, as a magnetic layer, you may be a ferrite system besides the above, an iron-rare earth system, GURANYURA of the structure where magnetic particles, such as Fe, Co, FeCo, and CoNiPt, were distributed in the nonmagnetic membrane which consists of SiO₂, BN, etc., etc. Moreover, a magnetic layer may be which record format of an inside mold and a vertical type.

[0080] Tothing stratification is prepared in order to control the irregularity on the front face of a medium. Neither the formation approach of toothing stratification nor especially an ingredient is restricted. Moreover, especially the formation location of toothing stratification is not restricted, either.

[0081] In the case of the magnetic-recording medium for non-contact mold recording method magnetic disk drives, this toothing stratification forms the irregularity resulting from the irregularity of toothing stratification in a medium front face, and of the irregularity on this front face of a medium, it prevents adsorption with the magnetic head and a magnetic-recording medium, and it is formed in order to raise CSS endurance.

[0082] In addition, in the case of the magnetic-recording medium for contact mold recording method magnetic disk drives, since it is desirable that a medium front face is flat as much as possible in order to avoid damage on the magnetic head or a magnetic-recording medium, it is not necessary to prepare toothing stratification.

[0083] As for the surface roughness of toothing stratification, it is desirable that it is Ra=10-50 A. The more desirable range is Ra=10-30 A.

[0084] When Ra is less than 10A, since the magnetic-recording medium front face is evenly near, the magnetic head and a magnetic-recording medium adsorb, the head crash by adsorption is caused and fatal damage is received [the magnetic head and a magnetic-recording medium get damaged, or], it is not desirable. Moreover, when Ra exceeds 50A, since glide height becomes large and the fall of recording density is caused, it is not desirable.

[0085] the quality of the material and the formation approach of toothing stratification — a ***** cage — especially, it is not restricted. As the quality of the material of toothing stratification, the oxide of metals and those alloys, such as aluminum, Ti, Cr, Ag, Nb, Ta, Bi, Si, Zr, Cu, Ce, Au, Sn, Pd, Sb, germanium, Mg, In, W, and Pb, or a these metals and an alloy, a nitride, and carbide can be used, formation is easy — etc. — it is desirable that it is the metal which uses aluminum, such as aluminum simple substance, aluminum alloy, Oxidation aluminum (aluminum 2O₃ etc.), and Nitriding aluminum (AlN etc.), as a principal component from a viewpoint.

[0086] Tothing stratification is good also as continuous texture film, and may consist of island-like projections distributed discretely. As for the height of this island-like projection, it is desirable that it is 100-500A, and it is more desirable that it is 100-300A.

[0087] The surface roughness of the toothing stratification mentioned above and concavo-convex (projection) height are controllable by the quality of the material of toothing stratification and its presentation, heat treatment conditions, etc.

[0088] As other concavo-convex formation approaches, texture processing by mechanical polish, texture processing by chemical etching, texture processing by energy beam exposure, etc. are mentioned, and those approaches can also be combined.

[0089] As a protective layer, Cr film, Cr alloy film, the carbon film, the hydrogenation carbon film, the zirconia film, the silica film, etc. are mentioned, for example. These protective coats can be continuously formed with an inline type or a standing opposed type sputtering system with a substrate layer, a magnetic layer, etc. Moreover, these protective coats are good also as a multilayer configuration which may be a monolayer or consists of film the same or of a different kind.

[0090] It may change to the above-mentioned protective layer top or the above-mentioned protective layer, and other protective layers may be formed. For example, instead of the above-mentioned protective layer, a colloidal silica particle may be distributed and applied to the inside which diluted the tetra-alkoxy run with the solvent of an alcoholic system, it may calcinate to it further, and the silicon oxide (SiO₂) film may be formed in it. In this case, the function of both a protective layer and toothing stratification is achieved.

[0091] Although proposals various as a lubricating layer are made, generally, it applies to a medium front face with a dipping method (dip coating), a spin coat method, a spray method, etc., and if needed, it heat-treats and the fluid lubrication agent which consists of a perfluoro polyether (PFPE) etc. is formed.

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EXAMPLE

[Example] Hereafter, based on an example, this invention is explained still more concretely.

[0093] Example 1 [0094] (1) The disc-like glass substrate (0.25 inches in the outer diameter of 2.5 inches, the bore of 0.8 inches, thickness) which has a circular hole was prepared for the center section which consists of reserve valence metal ion content silicate glass (high Young's modulus glass) (Tg: 600 degree C) of a glass substrate. In addition, as high valence metal ion content silicate glass, it was a mol % displays, and SiO₂ was used and the glass which contains CaO for MgO 6% 2%, and contains [Li₂O / 8% and Na₂O] ZrO₂ for TiO₂ 2% 15% 19% was used for aluminum 2O₃ 5% 43%.

[0095] (2) The chemical strengthening was given after washing a chemical-strengthening process, next the above-mentioned glass substrate. The chemical strengthening prepared the chemical-strengthening processing liquid which mixed the potassium nitrate (60%) and the sodium nitrate (40%), heated this chemical-strengthening processing liquid at 480 degrees C, was immersed for about 4 hours and performed the glass substrate [finishing / washing] by which the preheating was carried out to 300 degrees C. In order to carry out the chemical strengthening of the whole front face of a glass substrate in the case of this immersion, it carried out in the condition of having contained in the electrode holder so that two or more glass substrates might be held by the end face.

[0096] Thus, by carrying out immersion processing at chemical-strengthening processing liquid, the lithium ion of a glass substrate surface and sodium ion are permuted by the sodium ion in chemical-strengthening processing liquid, and potassium ion, respectively, and a glass substrate is strengthened. The thickness of the compressive-stress layer formed in the surface of a glass substrate was about 100-200 micrometers.

[0097] (3) Carry out sequential annealing of the glass substrate which finished cooling, acid treatment, and the washing process above-mentioned chemical strengthening for a start at the second annealing room. First, a glass substrate is pulled up from chemical-strengthening processing liquid, and it transports to the first annealing room currently heated by 300 degrees C, it holds for about 10 minutes in this, and a glass substrate is annealed at 300 degrees C. Subsequently, a glass substrate is transported to the second annealing room currently heated by 200 degrees C from the first annealing room, and a glass substrate is annealed from 300 degrees C to 200 degrees C. Thus, by dividing into two steps and cooling slowly, a glass substrate can be opened from the damage by heat distortion. Next, it was immersed in the 20-degree C tank, and the glass substrate which finished the above-mentioned annealing was quenched, and was maintained for about 20 minutes. To neutral detergent, neutral detergent, pure water, pure water, and each washing tub of IPA (isopropyl alcohol) and IPA (steam seasoning), sequential immersion was carried out and the glass substrate which finished the above-mentioned cooling process was washed. In addition, the supersonic wave (frequency of 40kHz) was impressed to each washing tub.

[0098] (4) It processed by immersing a glass substrate in this using the fused salt of the potassium pyrosulfate of the down-stream-processing reagent chemicals by fused salt. Under the present circumstances, as shown in Table 3, 2 hours or after supplying for 4 hours, processing was performed for the steam (air: 2000cm³/min, steam: 1 g/min (it computed from the decrement/time amount of water), steam temperature: 280 degree C) to fused salt (samples 1 and 2). In addition, when a steam was not supplied to fused salt for a comparison (comparison sample 2), the sample was prepared also about the case (comparison sample 1) where processing by the fused salt of a potassium pyrosulfate is not performed. Temperature of fused salt was made into 300 degrees C, and immersion time amount was set as for 5 minutes.

[0099] After carrying out washing processing of the glass substrate after the above-mentioned processing, the elution test and the environmental test were carried out. The result is shown in Table 3. Table 3 shows that processing by the fused salt of a potassium pyrosulfate is effective.

[0100]

[Table 3]

(明細：高原子価イオン含有ガラス)

	処 理 方 法	溶出試験結果	環境試験結果	表面観察結果
		Li, Na, Kの合計溶出量 (μ mol/Disk)		
比較試料 1	K ₂ S ₂ O ₇ 処理なし	8.7	5 μ m程度のヤケが多数	○
比較試料 2	K ₂ S ₂ O ₇ 処理 (300℃, 5分)	0.2	5 μ m程度のヤケなし	○
試料 1	水蒸気 2 時間供給後 K ₂ S ₂ O ₇ 処理 (300℃, 5分)	0.2	5 μ m程度のヤケなし	○
試料 2	水蒸気 4 時間供給後 K ₂ S ₂ O ₇ 処理 (300℃, 5分)	0.2	5 μ m程度のヤケなし	○

K₂S₂O₇融相温度: 210℃

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[0101] in addition, the inside of the ultrapure water with which the elution test heated the glass substrate at 80 degrees C — 24 hours — being immersed — a leached moiety — ion chromatography — a quantum — carrying out — the elution volume (mmol/Disk) of the alkali-metal ion per glass substrate — it asked. The environmental test left the glass substrate for one week under the heat-and-high-humidity environment of the temperature of 80 degrees C, and 80% of relative humidity, carried out microscope observation of the glass front face, and observed and evaluated the deposit of the chloride of the alkali by the elution of alkali etc.

[0102] As example 2 glass substrate Glass ceramics which have a 2 silicic-acid lithium (Li₂O and 2SiO₂) and alpha quartz watch (SiO₂) as a main crystal phase (2:76.0 % of the weight of SiO(s)) Li₂O: 9.7 % of the weight, Na₂O:1.0 % of the weight, K₂O:3.5 % of the weight, MgO: 1.5 % of the weight and 2O₃:3.5 % of the weight [of aluminum] P 2O₅:3.0 % of the weight, After heating the glass containing 2:1.5 % of the weight of TiO(s), and 2O₃:0.3 % of the weight of As(es) with about 4.0-degree-C programming rate for /and holding it at this formation temperature for 1.5 hours, what heated with about 2.0-degree-C programming rate for /, and was held at 815 degrees C for 2.5 hours was prepared. About this glass substrate, after performing washing processing, it processed with the fused salt of a potassium pyrosulfate, and the elution test and the environmental test were carried out like the example 1. Moreover, it tested similarly about the sample which does not perform processing by the potassium pyrosulfate for a comparison. Those results are shown in Table 4.

[0103]

[Table 4]

(例種：結晶化ガラス)

	処 理 方 法	溶出試験結果	環境試験結果	表面観察 結果
		Li, Na, Kの合計溶出量 (μ mol/Disk)		
比較試料 3	K ₂ S ₂ O ₇ 処理なし	4.8	5 μ m程度のヤケが密集	○
比較試料 4	水蒸気導入なし K ₂ S ₂ O ₇ 処理 (250℃、5分)	0.1	5 μ m程度のヤケなし	○
試料 3	水蒸気 2時間供給後 K ₂ S ₂ O ₇ 処理 (250℃、5分)	0.1	5 μ m程度のヤケなし	○
試料 4	水蒸気 4時間供給後 K ₂ S ₂ O ₇ 処理 (250℃、5分)	0.1	5 μ m程度のヤケなし	○

K₂S₂O₇液相温度:210℃

[0104] Table 4 shows that processing by the fused salt of a potassium pyrosulfate is effective also about the ceramics containing alkali.

[0105] As example 3 glass substrate Glass ceramics which have a potassium FURORORIHTE light and a potassium kana site as a main crystal phase (2:56.5 % of the weight of SiO(s)) MgO: 11.8 % of the weight, CaO:14.1 % of the weight, Na₂O:5.4 % of the weight, K₂O: After heating the glass containing 8.7 % of the weight and F:5.5 % of the weight with about 4.0-degree-C programming rate for /and holding it at this formation temperature for 1.5 hours, what heated with about 2.0-degree-C programming rate for /, and was held at 840 degrees C for 2.5 hours was prepared. About this glass substrate, after performing washing processing, it processed with the fused salt of a potassium pyrosulfate, and the elution test and the environmental test were carried out like the example 1. Moreover, it tested similarly about the sample which does not perform processing by the potassium pyrosulfate for a comparison. Those results are shown in Table 5.

[0106]

[Table 5]

(例種：結晶化ガラス)

	処 理 方 法	溶出試験結果	環境試験結果	表面観察 結果
		Li, Na, Kの合計溶出量 (μ mol/Disk)		
比較試料 5	K ₂ S ₂ O ₇ 処理なし	1.7	5 μ m程度のヤケが密集	○
比較試料 6	水蒸気導入なし K ₂ S ₂ O ₇ 処理 (250℃、5分)	0.1	5 μ m程度のヤケなし	○
試料 5	水蒸気 2時間供給後 K ₂ S ₂ O ₇ 処理 (250℃、5分)	0.1	5 μ m程度のヤケなし	○
試料 6	水蒸気 4時間供給後 K ₂ S ₂ O ₇ 処理 (250℃、5分)	0.1	5 μ m程度のヤケなし	○

K₂S₂O₇液相温度:210℃

[0107] The relation between the installation time of steam and crystal deposit time amount was investigated about K₂S₂O₇110kg

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fused salt at 4320 degrees C of examples. The result is shown in Table 6.

[0108]

[Table 6]

条 件	結 晶 析 出	備 考
水蒸気導入なし	120時間後	
水蒸気導入3時間	220時間後	Air:2000cm ³ /min,Steam:1g/min
水蒸気導入(継続)	析出せず	Air:2000cm ³ /min,Steam:1g/min

[0109] When a steam was not introduced, the crystal deposited in 120 hours, but when a steam was introduced for 3 hours, the crystal deposited in 220 hours, and when a steam was continued and introduced, the crystal did not deposit.

[0110] The difference by the difference in the approach of compensating example 5 moisture was investigated. The result is shown in Table 7.

[0111]

[Table 7]

条 件	結 晶 析 出	備 考
KHSO ₄ 添加	72時間後	KHSO ₄ 440 g 添加
水蒸気導入3時間	100時間後	Air:2000cm ³ /min,Steam:1g/min

[0112] In potassium-hydrogensulfate addition, time amount until it adds moisture when a crystal deposits, and then a crystal deposits was 72 hours after, and when a steam was introduced for 3 hours, it was 100 hours after. In addition, as for the crystal, in any case, it disappeared immediately by moisture addition.

[0113] The elution test and the environmental test were carried out like the example 1 except having used the fused salt of the sodium pyrosulfate of reagent chemicals, the fused salt of a potassium hydrogensulfate, or the fused salt of a sodium hydrogensulfate instead of the fused salt of example 6 potassium pyrosulfate. The result is shown in Table 8.

[0114]

[Table 8]

(珪酸：高原子価(T102,Y203等)を含有したアルミノシリケートガラス)

	処 理 方 法	溶出試験結果	環境試験結果	表面観察 結果
		Li,Na,Kの合計溶出量 (μmol/Disk)		
試料7	水蒸気2時間供給後 Na ₂ S ₂ O ₇ 処理(300℃、5分)	0.2	5μm程度はヤケなし	○
試料8	水蒸気4時間供給後 Na ₂ S ₂ O ₇ 処理(300℃、5分)	0.2	5μm程度はヤケなし	○
試料9	水蒸気2時間供給後 KHSO ₄ 処理 (300℃、5分)	0.2	5μm程度はヤケなし	○
試料10	水蒸気4時間供給後 KHSO ₄ 処理 (300℃、5分)	0.2	5μm程度はヤケなし	○
試料11	水蒸気2時間供給後 NaHSO ₄ 処理(300℃、5分)	0.2	5μm程度はヤケなし	○
試料12	水蒸気4時間供給後 NaHSO ₄ 処理(300℃、5分)	0.2	5μm程度はヤケなし	○

Na₂S₂O₇液相温度:190℃、KHSO₄液相温度:210℃、NaHSO₄液相温度:190℃

[0115] The elution test and the environmental test were carried out like the example 1 except having used the fused salt which mixed the potassium pyrosulfate of example 7 reagent chemicals, and the sodium pyrosulfate of reagent chemicals, or having used the fused salt which mixed the potassium hydrogensulfate of reagent chemicals, and the sodium hydrogensulfate of reagent chemicals. The result is shown in Table 9.

[0116]

[Table 9]

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(明種：高原子価イオン含有ガラス)

	処 理 方 法	溶出試験結果	環境試験結果	表面観察 結果
		Li, Na, Kの合計溶出量 ($\mu\text{mol/Disk}$)		
試料 1 3	水蒸気 2 時間供給後 Na ₂ S ₂ O ₇ ・K ₂ S ₂ O ₇ 焼 (300℃, 5分)	1.1	5 μm 程度のヤケなし	○
試料 1 4	水蒸気 4 時間供給後 Na ₂ S ₂ O ₇ ・K ₂ S ₂ O ₇ 焼 (300℃, 5分)	1.2	5 μm 程度のヤケなし	○
試料 1 5	水蒸気 2 時間供給後 NaHSO ₄ ・KHSO ₄ 処理 (300℃, 5分)	1.1	5 μm 程度のヤケなし	○
試料 1 6	水蒸気 4 時間供給後 NaHSO ₄ ・KHSO ₄ 処理 (300℃, 5分)	1.2	5 μm 程度のヤケなし	○

Na₂S₂O₇:K₂S₂O₇ = 50wt%:50wt%, NaHSO₄:KHSO₄ = 50wt%:50wt%

Na₂S₂O₇・K₂S₂O₇ 液相温度:150℃、NaHSO₄・KHSO₄ 液相温度:150℃

[0117] The elution test and the environmental test were carried out like the example 1 except having used the fused salt which becomes in addition so that a sulfuric acid may be set to 1:1 to example 8 potassium pyrosulfate by the weight ratio. The result is shown in Table 10.

[0118]

[Table 10]

(明種：高原子価イオン含有ガラス)

	処 理 方 法	溶出試験結果	環境試験結果	表面観察 結果
		Li, Na, Kの合計溶出量 ($\mu\text{mol/Disk}$)		
試料 1 7	水蒸気 2 時間供給後 K ₂ S ₂ O ₇ ・硫酸 処理 (300℃, 5分)	0.2	5 μm 程度のヤケなし	○
試料 1 8	水蒸気 4 時間供給後 K ₂ S ₂ O ₇ ・硫酸 処理 (300℃, 5分)	0.2	5 μm 程度のヤケなし	○

K₂S₂O₇:硫酸 = 50wt%:50wt%

[0119] Instead of example 9 - 11 quantity valence metal ion content glass, it is alumino silicate glass (presentation : being a mol % display). aluminum 203 0 to 2.8% for ZrO₂ 57 to 74% 3 - 15%, [SiO₂] Na₂O is used as a principal component for Li₂O 4 to 14% 7 to 16%. Content, Tg:500 degree C, Chemical-strengthening processing: The elution test and the environmental test were carried out like the example 1 except having used soda lime glass (example 10), soda aluminosilicate glass (example 11), and the BOROSHIRIKE toga lath containing a heavy metal ion for 400 degrees C and 3 hours (example 9). Consequently, the same effectiveness as an example 1 was accepted. In addition, the result of an example 9 (alumino silicate glass) is shown in Table 11.

[0120]

[Table 11]

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(硝種：アルミノシリケートガラス)

	処 理 方 法	溶出試験結果	環境試験結果	表面観察 結果
		Li, Na, Kの合計溶出量 ($\mu\text{mol/Disk}$)		
比較試料 7	K2S2O7処理なし	2.0	5 μm 以上のヤケが密集	○
比較試料 8	水蒸気導入なし K2S2O7処理 (250℃、5分)	0.1	5 μm 以上のヤケなし	○
比較試料 9	水蒸気導入なし K2S2O7処理 (300℃、5分)	0.0	5 μm 以上のヤケなし	○
試料 19	水蒸気2時間供給後 K2S2O7処理 (250℃、5分)	0.1	5 μm 以上のヤケなし	○
試料 20	水蒸気4時間供給後 K2S2O7処理 (250℃、5分)	0.1	5 μm 以上のヤケなし	○
試料 21	水蒸気2時間供給後 K2S2O7処理 (300℃、5分)	0.0	5 μm 以上のヤケなし	○
試料 22	水蒸気4時間供給後 K2S2O7処理 (300℃、5分)	0.0	5 μm 以上のヤケなし	○

K2S2O7液相温度:210℃

[0121] in addition, the above-mentioned example — most stress relaxation was not accepted in the substrate after fused salt processing of the examples 1, 6, 7, 8, and 9 which processed the substrate which carried out chemical-strengthening processing with fused salt one to 11 inside.

[0122] The substrate layer which consists of aluminum (50A of thickness)/Cr(1000A)/CrMo (100A), the magnetic layer which consists of CoPtCr(120A)/CrMo(50A)/CoPtCr (120A), and Cr (50A) protective layer were formed in both sides of the glass substrate for magnetic disks obtained in the example 12 examples 1-11 with the inline-type sputtering system.

[0123] By dipping the above-mentioned substrate in the organic silicon compound solution (mixed liquor of water, IPA, and a tetra-ethoxy silane) which distributed the silica particle (grain size of 100A), and calcinating it, the protective layer which consists of SiO2 was formed, DIP processing of this protective layer top was further carried out to the lubricant which consists of a perphloro polyether, the lubricating layer was formed, and the magnetic disk for MR heads was obtained.

[0124] When the glide test was carried out about the obtained magnetic disk, the hit or crash resulting from the foreign matter by deformation of a substrate, elution, YAKE of alkali, etc. were not accepted. Moreover, it has also checked that the defect had not occurred on film, such as a magnetic layer.

[0125] Moreover, when weatherability and a life were investigated, degradation or the defect of the magnetic film resulting from deterioration of a glass substrate front face etc. were not accepted.

[0126] The in-line-type sputtering system was used for both sides of the glass substrate for magnetic disks obtained in the example 13 examples 1-11, sequential membrane formation of Cr substrate layer, a CrMo substrate layer, a CoPtCr magnetic layer, and the C protective layer was carried out, and the magnetic disk was obtained. It was checked that it is the same as that of an example 12 about the above-mentioned magnetic disk.

[0127] The magnetic disk for thin film heads was obtained like the example 13 except having made the example 14 substrate layer into aluminum/Cr/Cr, and having set the magnetic layer to CoNiCrTa. It was checked that it is the same as that of an example 12 about the above-mentioned magnetic disk.

[0128] Although the desirable example was given above and this invention was explained, this invention is not necessarily limited to the above-mentioned example.

[0129] For example, the heating temperature of fused salt, such as pyrosulfate, a class, immersion time amount, etc. are not limited to the thing of an example, but according to demand quality level etc., are changed suitably and can be carried out. Moreover, a washing process can be carried out after the process of the arbitration in a production process if needed.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is drawing for explaining one mode of the supply approach of a steam.

[Drawing 2] It is drawing for explaining other modes of the supply approach of a steam.

[Description of Notations]

1 Well-closed Container

2 Water

3 Ayr Supply Pipe

4 Steam Tubing

5 Processing Tub

6 Fused Salt

[Translation done.]

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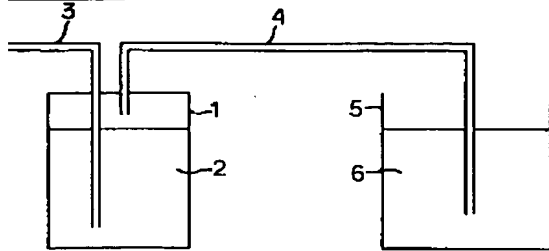
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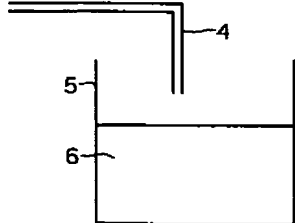
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DRAWINGS

[Drawing 1]



[Drawing 2]



[Translation done.]

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(54) 【発明の名称】 情報記録媒体用基板の製造方法及び情報記録媒体

(57) 【要約】

【課題】 ガラス基板からのアルカリ等の溶出を高いレベルで抑制できるとともに、溶出防止処理の効果を持続しつつ長期間連続して均一に処理できる情報記録媒体用基板の製造方法等を提供する。

【解決手段】 情報記録媒体用のガラスを主成分とした基板を、硫酸水素塩及び／又はピロ硫酸塩を含有する溶融塩に接触させて、ガラス成分の溶出を抑制する処理を行う際に、溶融塩の結晶化を抑制する処理（例えば、溶融塩に水分を補う処理）を施す。

【特許請求の範囲】

【請求項 1】 情報記録媒体用のガラスを主成分とした基板を、少なくとも硫酸水素塩及び／又はピロ硫酸塩を含有する熔融塩に接触させて、ガラス成分の溶出を抑制する処理を行う際に、熔融塩の結晶化を抑制する処理を施すことを特徴とする情報記録媒体用基板の製造方法。

【請求項 2】 前記熔融塩に接触させてガラス成分の溶出を抑制する処理、及び熔融塩の結晶化を抑制する処理を、ガラス基板の化学強化処理後に行い、前記熔融塩による処理を化学強化処理温度より少なくとも 50℃低い温度で行うことを特徴とする請求項 1 記載の情報記録媒体用基板の製造方法。

【請求項 3】 前記熔融塩に接触させてガラス成分の溶出を抑制する処理を、該熔融塩の昇華温度未満で行うことを特徴とする請求項 1 又は 2 記載の情報記録媒体用基板の製造方法。

【請求項 4】 溶出を抑制するガラス成分が、アルカリイオンであることを特徴とする請求項 1 乃至 3 のいずれかに記載の情報記録媒体用基板の製造方法。

【請求項 5】 熔融塩の結晶化を抑制する処理が、熔融塩に水分を供給する処理であることを特徴とする請求項 1 乃至 4 のいずれかに記載の情報記録媒体用基板の製造方法。

【請求項 6】 熔融塩の結晶化を抑制する処理が、熔融塩から失われる水分を補う処理であることを特徴とする請求項 1 乃至 5 のいずれかに記載の情報記録媒体用基板の製造方法。

【請求項 7】 硫酸水素塩及び／又はピロ硫酸塩を含有する熔融塩が、さらに硫酸を加えてなる熔融塩であることを特徴とする請求項 1 乃至 6 のいずれかに記載の情報記録媒体用基板の製造方法。

【請求項 8】 水分の供給方法又は水分を補う方法が、熔融塩中に水蒸気を導入する方法であることを特徴とする請求項 5 又は 6 記載の情報記録媒体用基板の製造方法。

【請求項 9】 水分の供給方法又は水分を補う方法が、熔融塩を水蒸気雰囲気下に置く方法であることを特徴とする請求項 5 又は 6 記載の情報記録媒体用基板の製造方法。

【請求項 10】 水分の供給方法又は水分を補う方法が、熔融塩に硫酸水素塩を添加する方法であることを特徴とする請求項 5 又は 6 記載の情報記録媒体用基板の製造方法。

【請求項 11】 熔融塩の温度が、熔融温度又は液相温度～500℃であって、かつ熔融塩の昇華温度未満であることを特徴とする請求項 1 乃至 10 のいずれかに記載の情報記録媒体用基板の製造方法。

【請求項 12】 請求項 1 乃至 11 記載のいずれかに記載の情報記録媒体用基板の製造方法によって、ガラス表面が、Si-O-Na の非架橋状態から、Si-O-N

a の Na⁺ がヒドロニウムイオンとイオン交換されて水和状態になり、その後、加熱脱水によってシラノール基が形成され、そのシラノール基が脱水されて、ガラス表面で Si-O-Si の架橋化がなされた状態にすることを特徴とする情報記録媒体用基板の製造方法。

【請求項 13】 請求項 1 乃至 11 記載のいずれかに記載の情報記録媒体用基板の製造方法によって、ガラス基板表面を、Si-O-Na の非架橋状態から、Si-O-Si の架橋化がなされた状態にすることを特徴とする情報記録媒体用基板の製造方法。

【請求項 14】 情報記録媒体用基板が、化学強化処理を施されたガラス基板であることを特徴とする請求項 1 乃至 13 のいずれかに記載の情報記録媒体用基板の製造方法。

【請求項 15】 情報記録媒体用基板が、結晶化ガラス基板であることを特徴とする請求項 1 乃至 13 のいずれかに記載の情報記録媒体用基板の製造方法。

【請求項 16】 情報記録媒体用基板が、磁気抵抗型ヘッドで再生される磁気ディスクに使用される基板であることを特徴とする請求項 1 乃至 15 のいずれかに記載の情報記録媒体用基板の製造方法。

【請求項 17】 請求項 1 乃至 16 のいずれかに記載の情報記録媒体用基板の製造方法を用いて得られた情報記録媒体用基板上に、少なくとも記録層を形成したことを特徴とする情報記録媒体。

【請求項 18】 ガラスを主成分とした製品を、少なくとも硫酸水素塩及び／又はピロ硫酸塩を含有する熔融塩に接触させて、ガラス成分の溶出を抑制する処理を行う際に、熔融塩の結晶化を抑制する処理を施すことを特徴とするガラス製品の製造方法。

【請求項 19】 前記熔融塩に接触させてガラス成分の溶出を抑制する処理を、該熔融塩の昇華温度未満で行うことを特徴とする請求項 18 に記載のガラス製品の製造方法。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は、情報記録媒体用基板の製造方法及び情報記録媒体等に関する。

【0002】

【従来の技術】近年、情報記録媒体用基板として、他の材料と比較して各種特性に優れたガラス基板やセラミック基板が注目されている。詳しくは、磁気ディスク用基板としては、アルミニウム基板が多く用いられていたが、磁気ディスクの小型化、薄板化や磁気ヘッドの低浮上化の要請に伴い、アルミニウム基板に比べ小型化、薄板化が容易で平坦度が高く磁気ヘッドの低浮上化等が容易であるため、ガラス基板やセラミック基板を用いる割合が増えてきている。

【0003】情報記録媒体用基板としてガラス基板を用いる場合、耐衝撃性や耐振動性を向上させ衝撃や振動に

よって基板が破損するのを防止する目的で、ガラス基板表面に化学強化処理を施して強度向上を図る場合が多い。化学強化処理としては、例えば、ガラス中のアルカリイオンを、それよりもイオン半径の大きいアルカリイオンと置換し、イオン交換部の容積増加によってガラス表面に強い圧縮応力を発生させてガラス表面を強化する方法（イオン交換法）等による場合が多い。イオン交換法を用いて化学強化を行う場合、その原理上アルカリイオンを含有したガラス基板を使用する必要がある。なお、アルカリイオンを含有した情報記録媒体用ガラス基板の中には、化学強化処理を施さなくても所定の強度を有する硝種（例えば、高原子価ガラスなど）もある。

【0004】情報記録媒体用基板としてセラミック（例えば、結晶化ガラス）基板を用いる場合は、結晶化によって耐衝撃性や耐振動性が向上するので、通常化学強化処理は必要としない。

【0005】情報記録媒体用基板としてガラスやセラミック基板を用いる場合、ガラスやセラミック基板に含まれるアルカリの溶出が問題となることが多く、アルカリの溶出を極力抑えることが望ましい。イオン交換処理後のガラス基板についてもアルカリの溶出が問題となる。

【0006】

【発明が解決しようとする課題】上述したように、情報記録媒体用基板としてガラスやセラミック基板を用いる場合、アルカリの溶出が問題となるが、アルカリの溶出を高いレベルで抑制する技術はほとんど開発されていない。

【0007】本発明は上記背景の下になされたものであり、ガラス基板からのアルカリや他の成分の溶出を高いレベルで抑制できるとともに、処理の効果を持続しつつ長期間連続して均一に処理できる情報記録媒体用基板の製造方法等の提供を目的とする。

【0008】

【課題を解決するための手段】本願出願人は、アルカリイオンを含有した情報記録媒体用ガラス基板を、硫酸水素塩（硝種：高原子価イオン含有ガラス）

* 素塩等の溶融塩に浸漬して処理することで、アルカリの溶出を著しく抑えることができることを見出し既に出願を行っている（特願平9-365326号）。ここで、ガラス基板を硫酸水素塩等の溶融塩に浸漬して処理するとガラス基板からのアルカリの溶出を高いレベルで抑制できる理由（メカニズム）は、ガラスの最表面層にある $\text{Si}-\text{O}-\text{Na}$ の非架橋状態から、硫酸水素塩中に含まれる水分から生じるヒドロニウムイオンと $\text{Si}-\text{O}-\text{Na}$ の Na^+ とがイオン交換し、シラノール基（ $\text{Si}-\text{O}-\text{H}$ ）となり、その後加熱によってシラノール基が脱水されてガラス表面で $\text{Si}-\text{O}-\text{Si}$ の架橋化がなされるためであると考えられる。本発明者らは、さらに研究を重ねた結果、硫酸水素塩（例えば KHSO_4 ）等の溶融塩で処理を続けていくと、水分が蒸発し、ピロ硫酸塩（例えば $\text{K}_2\text{S}_2\text{O}_7$ ）の結晶が析出し、処理の効果が低下することを見出した（例えば、 $2\text{KHSO}_4 \rightarrow \text{K}_2\text{S}_2\text{O}_7 + \text{H}_2\text{O} \uparrow$ の反応が起こり KHSO_4 が $\text{K}_2\text{S}_2\text{O}_7$ になってしまう）。そして、処理液に水分を補うことで、処理の効果を持続しつつ長期間連続して均一に処理できることを見出し本発明を完成するに至った。また、これらの効果は、ガラスやセラミックの種類によらず、例えば結晶化ガラスについても効果があることも見出した。さらに、アルカリだけでなく、アルカリ土類、 Si 、 Pb など他の溶出成分についても溶出を抑えることができることを見出した。アルカリ土類、 Si 等の溶出抑制効果に関する具体的なデータを表1及び表2に示す。表1及び表2から、ピロ硫酸塩の溶融塩、及び硫酸水素塩の溶融塩による処理が効果的であることがわかる。なお、溶出試験は、ガラス基板を80℃に加熱した超純水中に24時間浸漬し、溶出成分をイオンクロマトグラフィーで定量し、ガラス基板当たりのアルカリ金属イオンの溶出量（ $\mu\text{mol}/\text{Disk}$ ）求めた。

【0009】

【表1】

処 理 方 法	溶出試験結果 ($\mu\text{mol}/\text{Disk}$)	
	Si	Mg, Ca
K ₂ S ₂ O ₇ 処理なし	10	8.3
K ₂ S ₂ O ₇ 処理 (300℃、5分)	4.4	1.5
水蒸気2時間供給後 K ₂ S ₂ O ₇ 処理 (300℃、5分)	4.4	1.5
水蒸気4時間供給後 K ₂ S ₂ O ₇ 処理 (300℃、5分)	4.4	1.5

K₂S₂O₇液相温度:210℃

【0010】

50 【表2】

(硝種：高原子価イオン含有ガラス)

処 理 方 法	溶出試験結果 ($\mu\text{mol/Disk}$)	
	Si	Mg, Ca
KHSO ₄ 処理なし	10	3.3
KHSO ₄ 処理 (300℃、5分)	4.5	1.6
水蒸気2時間供給後 KHSO ₄ 処理 (300℃、5分)	4.5	1.6
水蒸気4時間供給後 KHSO ₄ 処理 (300℃、5分)	4.5	1.6

【0011】なお、ガラス成分のアルカリは情報記録媒体用ガラス基板だけでなく、光学ガラスやガラス食器のヤケの原因にもなるため、光学レンズ、プリズム、光学フィルター、光導波路、光モジュール、光学素子や光学部品、ディスプレイ用ガラス、太陽電池用基板ガラス、半導体用基板ガラス、イメージセンサ用基板ガラス、電子部品、転写マスク、ガラス食器等、耐候性の良いガラス製品を得る上でも本願発明の硫酸水素塩等の溶融塩による処理は有効である。

【0012】なお、公表特許公報（特表平11-503403号）には、基板表面の脱アルカリを AlCl_3 の存在下に湿式で行うか、または $(\text{NH}_4)_2\text{SO}_4$ のような硫酸塩の昇華により行う技術が開示されている。しかしながら、 AlCl_3 を用いた場合は処理温度が100℃と低いため、実施例にもあるとおり処理時間が24時間と長くなる。一方、硫酸塩の昇華により脱アルカリを行う場合は硫酸塩を気体にしなければならないため、実施例のように450～580℃と高温を要する。それに対し本願発明は硫酸塩を、それ自身が熔解する温度で溶融塩として接触させることにより脱アルカリ処理をするため、比較的低い温度（実施例では250～300℃）で、かつ5分程度の短時間での処理が可能である。そのため、T_g温度が低いガラスなど、広いT_g範囲のガラスを処理することができる、或いは低温処理のためガラス基板の変形を招くこともない、といったメリットを有する。具体的には本願発明はガラス基板のT_gが400℃付近のものまで適用可能である。情報記録媒体用ガラス基板と磁気ヘッドの間隔は40～50nmなので、ガラス基板が変形するとクラッシュを起こしてしまうといった問題が生じるので、情報記録媒体用ガラス基板におけるガラスの変形は大きな問題となる。また、特表平11-503403号公報においては、500℃で化学強化処理したガラスを500℃で $(\text{NH}_4)_2\text{SO}_4$ により脱アルカリ処理しているが、化学強化処理と同じ温度で脱アルカリ処理すると応力の緩和が起り、ガラス基板の強度が低下してしまい、情報記録媒体用ガラス基板の

強度低下を招く。それに対し、本願発明は化学強化処理よりも80～130℃低い温度で脱アルカリ処理しており、かつ、処理時間も5分と短いため、応力の緩和は殆ど起こらない。また、硫酸塩の昇華では気体になるため、密閉した状態で処理しなければならない、連続操作が難しいが、本願発明は液体のため密閉する必要がなく、連続操作が容易であり、かつ、脱アルカリの際に溶融塩の結晶化を抑制する処理を行うため、連続操作をしても、持続した脱アルカリの効果を得ることが可能である。

【0013】本発明は以下の構成としてある。

【0014】（構成1）情報記録媒体用のガラスを主成分とした基板を、少なくとも硫酸水素塩及び／又はピロ硫酸塩を含有する溶融塩に接触させて、ガラス成分の溶出を抑制する処理を行う際に、溶融塩の結晶化を抑制する処理を施すことを特徴とする情報記録媒体用基板の製造方法。

【0015】（構成2）前記溶融塩に接触させてガラス成分の溶出を抑制する処理、及び溶融塩の結晶化を抑制する処理を、ガラス基板の化学強化処理後に行い、前記溶融塩による処理を化学強化処理温度より少なくとも50℃低い温度で行うことを特徴とする構成1記載の情報記録媒体用基板の製造方法。

【0016】（構成3）前記溶融塩に接触させてガラス成分の溶出を抑制する処理を、該溶融塩の昇華温度未満で行うことを特徴とする構成1又は2記載の情報記録媒体用基板の製造方法。

【0017】（構成4）溶出を抑制するガラス成分が、アルカリイオンであることを特徴とする構成1乃至3のいずれかに記載の情報記録媒体用基板の製造方法。

【0018】（構成5）溶融塩の結晶化を抑制する処理が、溶融塩に水分を供給する処理であることを特徴とする構成1乃至4のいずれかに記載の情報記録媒体用基板の製造方法。

【0019】（構成6）溶融塩の結晶化を抑制する処理が、溶融塩から失われる水分を補う処理であることを特

徴とする構成 1 乃至 5 のいずれかに記載の情報記録媒体用基板の製造方法。

【0020】（構成 7）硫酸水素塩及び／又はピロ硫酸塩を含有する溶融塩が、さらに硫酸を加えてなる溶融塩であることを特徴とする構成 1 乃至 6 のいずれかに記載の情報記録媒体用基板の製造方法。

【0021】（構成 8）水分の供給方法又は水分を補う方法が、溶融塩中に水蒸気を導入する方法であることを特徴とする構成 5 又は 6 記載の情報記録媒体用基板の製造方法。

【0022】（構成 9）水分の供給方法又は水分を補う方法が、溶融塩を水蒸気雰囲気下に置く方法であることを特徴とする構成 5 又は 6 記載の情報記録媒体用基板の製造方法。

【0023】（構成 10）水分の供給方法又は水分を補う方法が、溶融塩に硫酸水素塩を添加する方法であることを特徴とする構成 5 又は 6 記載の情報記録媒体用基板の製造方法。

【0024】（構成 11）溶融塩の温度が、溶融温度又は液相温度～500℃であって、かつ溶融塩の昇華温度未滴であることを特徴とする構成 1 乃至 10 のいずれかに記載の情報記録媒体用基板の製造方法。

【0025】（構成 12）構成 1 乃至 11 記載のいずれかに記載の情報記録媒体用基板の製造方法によって、ガラス表面が、 Si-O-Na の非架橋状態から、 Si-O-Na の Na^+ がヒドロニウムイオンとイオン交換されて水和状態になり、その後、加熱脱水によってシラノール基が形成され、そのシラノール基が脱水されて、ガラス表面で Si-O-Si の架橋化がなされた状態にすることを特徴とする情報記録媒体用基板の製造方法。

【0026】（構成 13）構成 1 乃至 11 記載のいずれかに記載の情報記録媒体用基板の製造方法によって、ガラス基板表面を、 Si-O-Na の非架橋状態から、 Si-O-Si の架橋化がなされた状態にすることを特徴とする情報記録媒体用基板の製造方法。

【0027】（構成 14）情報記録媒体用基板が、化学強化処理を施されたガラス基板であることを特徴とする構成 1 乃至 13 のいずれかに記載の情報記録媒体用基板の製造方法。

【0028】（構成 15）情報記録媒体用基板が、結晶化ガラス基板であることを特徴とする構成 1 乃至 13 のいずれかに記載の情報記録媒体用基板の製造方法。

【0029】（構成 16）情報記録媒体用基板が、磁気抵抗型ヘッドで再生される磁気ディスクに使用される基板であることを特徴とする構成 1 乃至 15 のいずれかに記載の情報記録媒体用基板の製造方法。

【0030】（構成 17）構成 1 乃至 16 のいずれかに記載の情報記録媒体用基板の製造方法を用いて得られた情報記録媒体用基板上に、少なくとも記録層を形成したことを特徴とする情報記録媒体。

【0031】（構成 18）ガラスを主成分とした製品を、少なくとも硫酸水素塩及び／又はピロ硫酸塩を含有する溶融塩に接触させて、ガラス成分の溶出を抑制する処理を行う際に、溶融塩の結晶化を抑制する処理を施すことを特徴とするガラス製品の製造方法。

【0032】（構成 19）前記溶融塩に接触させてガラス成分の溶出を抑制する処理を、該溶融塩の昇華温度未満で行うことを特徴とする構成 18 に記載のガラス製品の製造方法。

10 【0033】

【作用】本発明では、情報記録媒体用基板を、硫酸水素塩等の溶融塩に浸漬して処理することで、アルカリの溶出を著しく抑えることができる。したがって、アルカリ金属イオンの表面への移動に起因するガラス表面の変質（ヤケ等）や異物の発生を著しく抑制できる。特に本発明では、処理液に水分を補うことで、水分が蒸発し、ピロ硫酸塩の結晶が析出して処理の効果が低下することがなく、処理の効果を持続しつつ長期間連続して均一に処理できる。また、アルカリ土類、 Si 、 Pb など他の溶出成分についても溶出を抑えることができる。この結果、耐水性や耐酸性等の向上を図ることができる。

【0034】また、本発明の情報記録媒体によれば、アルカリやその他の成分の溶出を著しく抑えたガラス基板を使用しているため、耐候性及び寿命に優れた高い信頼性を有する情報記録媒体を製造できる。

【0035】さらに、本発明のガラス製品及びその製造方法によれば、アルカリやその他の成分の溶出を著しく抑えた製品が得られるため、耐候性及び寿命に優れた高い信頼性を有するガラス製品が得られる。

30 【0036】

【発明の実施の形態】以下、本発明を詳細に説明する。

【0037】本発明の情報記録媒体用基板の製造方法においては、情報記録媒体用のガラスを主成分とした基板を、少なくとも硫酸水素塩及び／又はピロ硫酸塩を含有する溶融塩に接触させて、ガラス成分の溶出を抑制する処理を行う際に、溶融塩の結晶化を抑制する処理を施すことを特徴とする。

【0038】ここで、溶融塩の結晶化を抑制する処理としては、いかなる手段を採用してもよいが、例えば、溶融塩に水分を供給する方法（溶融塩にもとから含まれる水分量にかかわらず積極的に水分を供給する場合を含む）、又は、溶融塩から失われる水分を補う方法などが挙げられる。溶融塩の結晶化を抑制する処理としては、水分を供給又は補う方法以外の方法として、水分が蒸発するのを蒸気圧又は圧力で防止する方法、処理槽を密閉する方法などがある。なお、処理槽の周囲を密閉空間で覆い、この密閉空間を加湿して水分を供給するとともに溶融塩からの蒸発を抑える方法を採用する場合、処理槽の周囲を密閉するためには多くの費用がかかり、また、溶融塩から発生する SO_x を排気する必要があることか

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ら、注意が必要である。

【0039】溶融塩の結晶化を抑制する処理は、基板と溶融塩を接触させる前、接触させている最中のどちらで行ってもよい。また、処理液を処理槽から外部に循環させて、外部で溶融塩の結晶化を抑制する処理を行い、処理槽には結晶化が阻止された処理液が流入するシステムを採用することもできる。

【0040】溶融塩に水分を供給する方法、又は、溶融塩から失われる水分を補う方法として、より具体的には、以下の方法が挙げられる。

【0041】第一に、溶融塩中に水蒸気を導入する方法が挙げられる。この場合、例えば、スチームの吹き出しノズルを溶融塩中に挿入し、ノズルから公知の方法で発生させたスチームをバブリングさせて、水分を供給又は補えばよい。より具体的には、例えば、図1に示すように、密閉容器1に入れた水2を例えば100℃前後に加熱し、密閉容器中の水にエア供給管3から空気を供給し、湿った空気をスチーム管4を通して加熱して例えば280℃前後のスチームを発生させ、処理槽5内の溶融塩6中にスチーム管4の先端のノズルからスチームを供給し、水分を供給又は補えばよい。水蒸気の温度は、溶融塩の温度が下がり結晶化してしまうのを防ぐという観点からは、溶融塩の温度付近が好ましい。

【0042】第二に、溶融塩を水蒸気雰囲気下に置く方法が挙げられる。この場合、例えば、図2に示すように、溶融塩6の上部に配置したスチーム管4の先端のノズルから溶融塩6に向かってスチームを噴射し、水分を供給又は補えばよい。

【0043】第三に、溶融塩に硫酸水素塩や、硫酸水素塩の水和物などを添加して溶融塩の結晶化を阻止する方法が挙げられる。この場合は、溶融塩の容量が増加する。

【0044】その他の方法として、溶融塩に直接水を供給する方法があるが、この場合、高温の溶融塩中に水を入れると水蒸気爆発を起こすので、溶融塩の温度を一旦常温付近まで下げ、水を入れてゆっくりと反応させた後、処理温度まで再度昇温する必要がある。

【0045】本発明において、ピロ硫酸塩は、ピロ硫酸($H_2S_2O_7$)の塩で、二硫酸イオン($S_2O_7^{2-}$)とアルカリ金属、アルカリ土類金属、その他の金属、アンモニウム等との化合物である。2モルの硫酸水素塩から1モルの水が取れるとピロ硫酸塩となる。硫酸水素塩を融解させて溶融塩とすると、水を失ってピロ硫酸塩となる。この場合、水は蒸発するが、溶融塩中に僅かに残存する水がアルカリ溶出防止のメカニズムに関与する。

【0046】ピロ硫酸塩としては、アルカリ金属、アルカリ土類金属、アンモニウム、亜鉛、タリウム(I)、鉛(II)、鉄(II)、ウランなどの塩が挙げられる。安全性、環境保護、経済性及び取り扱い性等の観点からは、ピロ硫酸カリウム、ピロ硫酸ナトリウムなどが

好ましい。硫酸水素塩としては、アルカリ金属(Li、Na、K、Rb、Cs)、アルカリ土類金属(Mg、Ca、Sr、Ba)、アンモニウム、タリウム、鉛、バナジウム、ビスマス、ロジウムなどの塩が挙げられる。安全性等の観点からは、硫酸水素カリウム、硫酸水素ナトリウムなどが好ましい。

【0047】硫酸水素塩及び／又はピロ硫酸塩は、それぞれ一種単独を用いることができ、硫酸水素塩とピロ硫酸塩とを混合して用いることもできる。また、硫酸水素塩及び／又はピロ硫酸塩は、それぞれ二種以上の異なる塩を混合して用いることができる。この場合、混合割合は適宜調整できる。さらに、本発明の効果を損なわない範囲で他の成分を溶融塩に添加することもできる。

【0048】ピロ硫酸塩は硫酸塩に硫酸を加えることによっても得られるので、硫酸塩に硫酸を加えてピロ硫酸塩を作っても良い。硫酸水素塩等の塩で処理を長期的に行うと、ガラスから取り除かれたアルカリにより硫酸塩の結晶が溶融塩中に析出するが、硫酸塩の結晶は硫酸を加えることにより硫酸水素塩及び／又はピロ硫酸塩に戻すことができる。硫酸は硫酸水素塩等による溶融塩処理に支障をきたさないで、硫酸塩の結晶が析出する前に、溶融塩中に加えて処理を行っても良い。

【0049】溶融塩に「接触」させるとは、情報記録媒体用基板を溶融塩に浸漬する場合の他、情報記録媒体用基板の一方の面だけを溶融塩と接触させる場合も含む。

【0050】溶融塩の温度は、塩の溶融温度又は液相温度以上であれば良く、また、塩の昇華温度未満であればよい。アルカリの溶出を抑制する効果の点では、温度にそれほど依存しないが、250～300℃以上とすると、アルカリの溶出がゼロになるかあるいはゼロに近くなるので好ましい。一方、ガラス表面の青ヤケによって表面硬度などが低下し、記録層を形成して情報記録媒体としたときの長期的な信頼性において問題となるため、350℃～500℃以下とすることが好ましい。500℃を上限としたのは、500℃を超えると溶融塩の分解が起こり易いからである。なお、イオン交換によって化学強化されたガラスの化学強化層が消失し強度が低下することを考慮すると、化学強化ガラスの場合は、300℃～350℃以下とすることが好ましい。以上のような観点から、溶融塩の温度は、溶融温度又は液相温度～500℃でかつ溶融塩の昇華温度未満(より好ましくは溶融温度又は液相温度～350℃)であることが好ましく、化学強化していないガラスについては250℃～350℃(さらに好ましくは270℃～350℃)であることがより好ましく、化学強化したガラスについては250℃～300℃(さらに好ましくは270℃～300℃)であることがより好ましい。なお、ピロ硫酸カリの融点は325℃(文献値)であるが一般にはその一部が水分を吸収して硫酸水素塩となるため210～300℃でも溶融状態にある。このように実際の溶融温度は融点

とは異なることがある。硫酸水素カリウムの融点は210℃である。硫酸水素ナトリウムの融点は185.7℃である。

【0051】溶融塩による処理時間は、アルカリの溶出を抑制する効果の点では、処理時間にそれほど依存しない。例えば、5分程度以上であれば処理時間を長くしてもアルカリの溶出を抑制する効果に大きな差異がない。このようなことから、溶融塩による処理時間は、1～30分程度が好ましく、処理効率や生産性を考慮すると5～10分程度がより好ましい。

【0052】なお、硫酸水素塩等の溶融塩による処理は、情報記録媒体用基板に損傷を与えることがない。また、ピロ硫酸塩等の溶融塩による処理によれば、鉄粉等のコンタミを除去する効果があり、化学強化処理に伴う析出溶融塩を除去する効果もある。

【0053】本発明において、ガラスを主成分とする基板（ガラスを主成分とする製品）とは、ガラス、アモルファスガラス、ガラスセラミック、結晶化ガラス、ガラスとセラミックとの複合材料等からなるものを指す。ガラス基板としては、 SiO_2 を骨格とするガラスが一般的であり、アルカリイオンを含有するものと、アルカリイオンを含有しないものがある。結晶化ガラスは、情報記録媒体用基板として用いる場合はアルカリイオンを含有したものが多いが、結晶化ガラスには、アルカリイオンを含有しないものもある。情報記録媒体用基板のサイズ、厚さ、形状等は特に制限されない。

【0054】アルカリイオンを含有したガラス基板としては、例えば、アルミノシリケートガラス、高原子価金属イオン（例えば、Ti、Yなど）含有シリケートガラス（高ヤング率ガラス）、ソーダライムガラス、ソーダアルミノシリケートガラス、アルミノボロシリケートガラス、ボロシリケートガラス、チェーンシリケートガラスなどが挙げられる。なお、アルミノシリケートガラス等は耐衝撃性や耐振動性を向上させるために化学強化することが好ましい。ただし、化学強化を必要としないアルカリイオンを含有したガラス基板の場合、化学強化は不要である。

【0055】アルミノシリケートガラスとしては、 SiO_2 : 62～75重量%、 Al_2O_3 : 5～15重量%、 Li_2O : 4～10重量%、 Na_2O : 4～12重量%、 ZrO_2 : 5.5～15重量%を主成分として含有するとともに、 $\text{Na}_2\text{O}/\text{ZrO}_2$ の重量比が0.5～2.0、 $\text{Al}_2\text{O}_3/\text{ZrO}_2$ の重量比が0.4～2.5である化学強化用ガラス、あるいは、 SiO_2 : 62～75重量%、 Al_2O_3 : 5～15重量%、 B_2O_3 : 0.5～5重量%、 Li_2O : 4～10重量%、 Na_2O : 4～12重量%、 MgO : 0.5～5重量%、 CaO : 0.5～5重量%、 Sb_2O_3 : 0.01～1.0重量%を主成分として含有する化学強化用ガラス等が好ましい。また、 ZrO_2 の未溶解物が原因で生じるガラス基板表面

の突起をなくすためには、モル%表示で、 SiO_2 を57～74%、 ZrO_2 を0～2.8%、 Al_2O_3 を3～15%、 Li_2O を7～16%、 Na_2O を4～14%含有する化学強化用ガラス等を使用することが好ましい。このような組成のアルミノシリケートガラスは、化学強化することによって、圧縮応力、引張応力、圧縮応力層の深さの三者をバランス良く制御できるとともに、抗折強度や、耐熱性に優れ、高温環境下であってもNa等の析出が少ないとともに平坦性を維持し、ヌーブ硬度にも優れる。

【0056】結晶化ガラス基板としては、主結晶相として珪酸リチウム($\text{Li}_2\text{O} \cdot 2\text{SiO}_2$)及びαクォーツ(SiO_2)を有する結晶化ガラスや、主結晶相としてカリウム・フロロリヒタライト($\text{KNaCaMgSi}_2\text{O}_7\text{F}_2$)及びカリウム・カサナイト($\text{K}_2\text{Na}_2\text{CaSi}_2\text{O}_7\text{F}_4$)を有するガラス等がある。具体的な組成としては、前者の場合、 SiO_2 : 60～86重量%、 Li_2O : 8～18重量%、 K_2O : 0～10重量%、 MgO : 0～8重量%、 ZnO : 0～10重量%、 Sb_2O_3 : 0～2重量%、 P_2O_5 : 0.1～10重量%、後者の場合、 SiO_2 : 50～75重量%、 CaO : 4～15重量%、 MgO : 5～30重量%、 F : 3～8重量%、 Na_2O : 2～9重量%、 Li_2O : 0～3重量%、 BaO : 0～2重量%、 Al_2O_3 : 0～10重量%等が挙げられる。

【0057】本発明では、必要に応じ、加熱した化学強化処理液にガラス基板を浸漬し、ガラス基板表層のイオンを化学強化処理液中のイオンでイオン交換して化学強化したガラス基板について、上述した溶融塩による処理を施すことができる。なお、化学強化処理を施したガラス基板を上記溶融塩で処理する際は、化学強化処理温度より少なくとも50℃、好ましくは60℃、更に好ましくは80℃低い温度で処理することが好ましい。

【0058】ここで、イオン交換法としては、低温型イオン交換法、高温型イオン交換法、表面結晶化法などが知られているが、高強度が得られやすいこと、変形がないこと等の観点から、低温型イオン交換法を用いることが好ましい。低温型イオン交換法は、ガラスの転移温度(T_g)以下の温度域で、ガラス中のアルカリイオンを、それよりもイオン半径の大きいアルカリイオンと置換し、イオン交換部の容積増加によってガラス表層に強い圧縮応力を発生させてガラス表面を強化する方法である。

【0059】化学強化処理液としては、硝酸カリウム(KNO_3)、硝酸ナトリウム(NaNO_3)、炭酸カリウム(K_2CO_3)などの溶融塩や、これらの塩を混合したもの（例えば、 $\text{KNO}_3 + \text{NaNO}_3$ 、 $\text{KNO}_3 + \text{K}_2\text{CO}_3$ など）の溶融塩、あるいは、これらの塩にCu、Ag、Rb、Csなどのイオンの塩を混合したものの溶融塩等が挙げられる。

【0060】加熱温度は、ガラス転移点の観点から、350℃～650℃、特に350℃～500℃、さらには350℃～450℃であることが好ましい。浸漬時間は、抗折強度と圧縮応力層の観点から、1時間～20時間程度とすることが好ましい。ガラス基板表面層に形成する圧縮応力層の厚さは、耐衝撃性や耐振動性を高めるという観点から、60～300μm程度とすることが好ましい。

【0061】本発明では、ガラス基板を熔融塩（硫酸水素塩等の熔融塩、又は化学強化処理液）で処理する前に、ガラス基板の割れやひびを防止するため、ガラス基板を200～350℃に予熱しておくことが好ましい。

【0062】硫酸水素塩等の熔融塩又は化学強化処理液による処理では、ガラス基板を端面で保持して処理を行うことが好ましい。これは、ガラス基板の表面の一部で保持するとその部分が処理されなくなるのを回避するためである。

【0063】本発明では、硫酸水素塩等の熔融塩及び／又は化学強化処理液による処理の後、熔融塩からガラス基板を引き上げ、熱歪みの発生を抑えることができるように所定温度まで徐冷することが好ましい。このように徐冷することにより、熱歪みによるダメージを回避できる。ガラス基板を徐冷する速度は、2℃/分～100℃/分、特に5℃/分～60℃/分、さらには10℃/分～50℃/分であることが好ましい。

【0064】本発明では、上記徐冷の後、例えば、ガラス基板表面に析出する熔融塩の結晶化を阻止する速度でガラス基板を急冷することが好ましい。このように、ガラス基板を急冷すると、析出する熔融塩が脆弱となり、硫酸水素塩等の熔融塩による処理工程や洗浄工程において熔融塩の除去が容易となる。

【0065】ガラス基板を急冷する速度は、1600℃/分～200℃/分、特に1200℃/分～300℃/分、さらには800℃/分～400℃/分であることが好ましい。ガラス基板の急冷は、ヒートショックの観点から、好ましくは100℃～0℃、さらに好ましくは40℃～10℃の冷媒に接触させて行うことが好ましい。ガラス基板を冷媒に接触させる時間は、析出熔融塩の洗浄性の観点から、10分～60分程度であることが好ましい。冷媒としては、水、温水、溶液などの液体冷媒、窒素ガス、水蒸気、冷却空気などの気体冷媒のほか、エアの吹き付けなどが挙げられる。

【0066】本発明では、必要に応じ、化学強化処理を施したガラス基板、又は化学強化処理を施さないガラス基板の表面を、硫酸水素塩等の熔融塩で処理することができる。なお、化学強化処理を施したガラス基板を上記熔融塩で処理する際は、化学強化処理温度より少なくとも50℃、好ましくは60℃、更に好ましくは80℃低い温度で処理することが好ましい。

【0067】本発明では、製造工程中の任意の工程の後

に、必要に応じ、市販の洗浄剤（中性洗浄剤、界面活性剤、アルカリ性洗浄剤など）による洗浄、スクラブ洗浄、純水洗浄、溶剤洗浄、溶剤蒸気乾燥、遠心分離乾燥等の公知の洗浄処理を行うことができる。また、各洗浄では、加熱や超音波印加を行ってもよい。

【0068】超音波は、ある周波数範囲で発振する多周波数型のもの、あるいは、一定の周波数で発振する固定周波数型のもののいずれであってもよい。周波数は低いほど洗浄効果は高いが、ガラス基板に与えるダメージも大きくなるので、これらのことを考慮して決定する。

【0069】蒸気乾燥は、乾燥速度が速いので乾燥によるシミが発生しにくい。蒸気乾燥に用いる溶剤としては、イソプロピルアルコール、フロン、アセトン、メタノール、エタノールなどが挙げられる。

【0070】上記本発明の情報記録媒体用基板の製造方法は、磁気ディスク用のガラス基板、光磁気ディスク用のガラス基板や、光メモリディスクなどの電子光学用ディスク基板の製造方法としても使用できる。特に、本発明の情報記録媒体用基板は、磁気抵抗型ヘッドで再生される磁気ディスクに使用されるガラス基板として好適に使用できる。詳しくは、従来に比べはるかに表面状態の良いガラス基板を使用することによって、磁気抵抗型ヘッドや大型磁気抵抗型ヘッド用の磁気ディスクとした場合にアルカリの溶出やヤケ等による異物に起因するベッドクラッシュを起こすことがなく、また、磁性層等の膜にアルカリの溶出やヤケ等に起因する欠陥が発生しエラーの原因となるということもない。

【0071】さらに、本発明の処理方法は、ガラスやセラミックスの構成成分（アルカリ金属、アルカリ土類金属、珪素、鉛など）の溶出を防ぐ必要がある分野の用途に広く使用できる。

【0072】次に、本発明の情報記録媒体について説明する。本発明の情報記録媒体は、上述した本発明方法を用いて得られた情報記録媒体用基板上に、少なくとも記録層を形成したことを特徴とする。ここで、記録層やその他の層としては公知のものを使用できる。

【0073】本発明の情報記録媒体では、アルカリイオン等の溶出を著しく抑制した情報記録媒体用基板を使用しているので、耐候性及び寿命に優れた高い信頼性を有する情報記録媒体が得られる。

【0074】以下、情報記録媒体の一例として磁気記録媒体について説明する。磁気記録媒体は、通常、磁気ディスク用基板上に、下地層、磁性層、凹凸形成層、保護層、潤滑層等を必要に応じ順次積層して製造する。

【0075】磁気記録媒体における下地層は、磁性層に応じて適宜選択される。下地層（シード層を含む）としては、例えば、Cr、Mo、Ta、Ti、W、V、B、Al、Niなどの非磁性金属から選ばれる少なくとも一種以上の材料からなる下地層等が挙げられる。Coを主成分とする磁性層の場合には、磁気特性向上等の観点か

ら、Cr単体やCr合金であることが好ましい。また、下地層は単層とは限らず、同一又は異種の層を積層した複数層構造とすることもできる。例えば、Cr/Cr、Cr/CrMo、Cr/CrV、CrV/CrV、Al/Cr/CrMo、Al/Cr/Cr、NiAl/Cr、NiAl/CrMo、NiAl/CrV等の多層下地層等が挙げられる。

【0076】磁性層の材料は特に制限されない。

【0077】磁性層としては、具体的には、例えば、Coを主成分とするCoPt、CoCr、CoNi、CoNiCr、CoCrTa、CoPtCr、CoNiPt、CoNiCrPt、CoNiCrTa、CoCrPtTa、CoCrPtSiOなどの磁性薄膜が挙げられる。また、磁性層を非磁性膜（例えば、Cr、CrMo、CrVなど）で分割してノイズの低減を図った多層構成（例えば、CoPtCr/CrMo/CoPtCr、CoCrTaPt/CrMo/CoCrTaPtなど）としもよい。

【0078】磁気抵抗型ヘッド（MRヘッド）又は大型磁気抵抗型ヘッド（GMRヘッド）対応の磁性層としては、Co系合金に、Y、Si、希土類元素、Hf、Ge、Sn、Znから選択される不純物元素、又はこれらの不純物元素の酸化物を含有させたものなども含まれる。

【0079】また、磁性層としては、上記の他、フェライト系、鉄-希土類系や、SiO₂、BNなどからなる非磁性膜中にFe、Co、FeCo、CoNiPt等の磁性粒子が分散された構造のグラニューなどであってもよい。また、磁性層は、内面型、垂直型のいずれの記録形式であってもよい。

【0080】凹凸形成層は、媒体表面の凹凸を制御する目的で設けられる。凹凸形成層の形成方法や材料等は特に制限されない。また、凹凸形成層の形成位置も特に制限されない。

【0081】この凹凸形成層は、非接触型記録方式磁気ディスク装置用の磁気記録媒体の場合、媒体表面に凹凸形成層の凹凸に起因した凹凸を形成し、この媒体表面の凹凸によって、磁気ヘッドと磁気記録媒体との吸着を防止し、CSS耐久性を向上させる目的で形成される。

【0082】なお、接触型記録方式磁気ディスク装置用の磁気記録媒体の場合には、磁気ヘッドや磁気記録媒体の損傷を避けるため媒体表面はできるだけ平坦であることが好ましいので、凹凸形成層を設ける必要はない。

【0083】凹凸形成層の表面粗さは、Ra=10~50オングストロームであることが好ましい。より好ましい範囲は、Ra=10~30オングストロームである。

【0084】Raが10オングストローム未満の場合、磁気記録媒体表面が平坦に近い場合、磁気ヘッドと磁気記録媒体とが吸着し、磁気ヘッドや磁気記録媒体が傷ついてしまったり、吸着によるヘッドクラッシュを起こし

致命的な損傷を受けるので好ましくない。また、Raが50オングストロームを超える場合、グライドハイトが大きくなり記録密度の低下を招くので好ましくない。

【0085】凹凸形成層の材質及び形成方法は多種知られており、特に制限されない。凹凸形成層の材質としては、Al、Ti、Cr、Ag、Nb、Ta、Bi、Si、Zr、Cu、Ce、Au、Sn、Pd、Sb、Ge、Mg、In、W、Pb等の金属やそれらの合金、又はそれら金属や合金の酸化物、窒化物、炭化物を使用することができる。形成が容易である等の観点からは、Al単体やAl合金、酸化Al（Al₂O₃など）、窒化Al（AlNなど）といったAlを主成分とする金属であることが望ましい。

【0086】凹凸形成層は、連続したテクスチャー膜としてもよく、離散的に分布した島状突起で構成してもよい。この島状突起の高さは、100~500オングストロームであることが好ましく、100~300オングストロームであることがより好ましい。

【0087】上述した凹凸形成層の表面粗さ及び凹凸（突起）の高さは、凹凸形成層の材質及びその組成、熱処理条件等によって制御できる。

【0088】他の凹凸形成方法としては、機械的研磨によるテクスチャー加工、化学的エッチングによるテクスチャー加工、エネルギービーム照射によるテクスチャー加工などが挙げられ、それらの方法を組み合わせることもできる。

【0089】保護層としては、例えば、Cr膜、Cr合金膜、カーボン膜、水素化カーボン膜、ジルコニア膜、シリカ膜等が挙げられる。これらの保護膜は、下地層、磁性層等とともにインライン型又は静置対向型スパッタリング装置で連続して形成できる。また、これらの保護膜は、単層であってもよく、あるいは、同一又は異種の膜からなる多層構成としてもよい。

【0090】上記保護層上に、あるいは上記保護層に替えて、他の保護層を形成してもよい。例えば、上記保護層の代わりに、テトラアルコキシランをアルコール系の溶媒で希釈した中に、コロイダルシリカ微粒子を分散して塗布し、さらに焼成して酸化ケイ素（SiO₂）膜を形成してもよい。この場合、保護層と凹凸形成層の両方の機能を果たす。

【0091】潤滑層としては多種多様な提案がなされているが、一般的には、パーフルオロポリエーテル（PFPE）等からなる液体潤滑剤を、媒体表面にディッピング法（浸漬法）、スピンコート法、スプレイ法等によって塗布し、必要に応じて加熱処理を行って形成する。

【0092】

【実施例】以下、実施例にもとづき本発明をさらに具体的に説明する。

【0093】実施例1

【0094】（1）ガラス基板の準備

高原子価金属イオン含有シリケートガラス（高ヤング率ガラス）（ $T_g: 600^\circ\text{C}$ ）からなる中央部に円孔を有する円盤状のガラス基板（外径2.5インチ、内径0.8インチ、厚さ0.25インチ）を用意した。なお、高原子価金属イオン含有シリケートガラスとしては、モル％表示で、 SiO_2 を43%、 Al_2O_3 を5%、 Li_2O を8%、 Na_2O を2%、 MgO を6%、 CaO を19%、 TiO_2 を15%、 ZrO_2 を2%含有するガラスを使用した。

【0095】（2）化学強化工程

次に、上記ガラス基板を洗浄後、化学強化を施した。化学強化は、硝酸カリウム（60%）と硝酸ナトリウム（40%）を混合した化学強化処理液を用意し、この化学強化処理液を 480°C に加熱し、 300°C に予熱された洗浄済みのガラス基板を約4時間浸漬して行った。この浸漬の際に、ガラス基板の表面全体が化学強化されるようにするため、複数のガラス基板が端面で保持されるようにホルダーに収納した状態で行った。

【0096】このように、化学強化処理液に浸漬処理することによって、ガラス基板表面のリチウムイオン、ナトリウムイオンは、化学強化処理液中のナトリウムイオン、カリウムイオンにそれぞれ置換されガラス基板は強化される。ガラス基板の表面に形成された圧縮応力層の厚さは、約 $100\sim 200\mu\text{m}$ であった。

【0097】（3）冷却、酸処理、洗浄工程

上記化学強化を終えたガラス基板を、第一、第二徐冷室で順次徐冷する。まず、化学強化処理液からガラス基板を引き上げ、 300°C に加熱されている第一徐冷室に移送し、この中で約10分間保持して 300°C にガラス基*

（銅盤：高原子価イオン含有ガラス）

*板を徐冷する。ついで、第一徐冷室から 200°C に加熱されている第二徐冷室にガラス基板を移送し、 300°C から 200°C までガラス基板を徐冷する。このように二段階に分けて徐冷することにより、熱歪みによるダメージからガラス基板を開放できる。次に、上記徐冷を終えたガラス基板を、 20°C の水槽に浸漬して急冷し約20分間維持した。上記冷却工程を終えたガラス基板を、中性洗剤、中性洗剤、純水、純水、IPA（イソプロピルアルコール）、IPA（蒸気乾燥）の各洗浄槽に順次浸漬して洗浄した。なお、各洗浄槽には超音波（周波数40kHz）を印加した。

【0098】（4）溶融塩による処理工程

特級試薬のピロ硫酸カリウムの溶融塩を用い、これにガラス基板を浸漬し、処理を行った。この際、表3に示すように、溶融塩に水蒸気（空気： $2000\text{cm}^3/\text{min}$ 、スチーム： $1\text{g}/\text{min}$ （水の減少量/時間から算出した）、水蒸気温度： 280°C ）を2時間又は4時間供給した後、処理を行った（試料1、2）。なお、比較のため、溶融塩に水蒸気を供給しない場合（比較試料2）、及び、ピロ硫酸カリウムの溶融塩による処理を行わない場合（比較試料1）についても試料を準備した。溶融塩の温度は 300°C とし、浸漬時間は5分間とした。

【0099】上記処理後のガラス基板を洗浄処理した後、溶出試験及び環境試験を実施した。その結果を表3に示す。表3から、ピロ硫酸カリウムの溶融塩による処理が効果的であることがわかる。

【0100】

【表3】

	処 理 方 法	溶出試験結果	環境試験結果	表面観察 結果
		Li, Na, Kの合計溶出量 ($\mu\text{mol}/\text{Disk}$)		
比較試料1	K2S2O7処理なし	8.7	5 μmol 以上ヤケが多数	○
比較試料2	K2S2O7処理（ 300°C 、5分）	0.2	5 μmol 以上ヤケなし	○
試料1	水蒸気2時間供給後 K2S2O7処理（ 300°C 、5分）	0.2	5 μmol 以上ヤケなし	○
試料2	水蒸気4時間供給後 K2S2O7処理（ 300°C 、5分）	0.2	5 μmol 以上ヤケなし	○

K2S2O7液相温度： 210°C

【0101】なお、溶出試験は、ガラス基板を 80°C に加熱した超純水中に24時間浸漬し、溶出成分をイオンクロマトグラフィで定量し、ガラス基板当たりのアルカリ金属イオンの溶出量（ $\mu\text{mol}/\text{Disk}$ ）求めた。環境試験は、温度 80°C 、相対湿度80%の高温多湿環境下にガラス基板を1週間放置し、ガラス表面を顕微鏡観察して、アルカリの溶出によるアルカリの塩化物等の析出を観測し、評価した。

【0102】実施例2

ガラス基板として、主結晶相として二珪酸リチウム（ $\text{Li}_2\text{O} \cdot 2\text{SiO}_2$ ）及び α クォーツ（ SiO_2 ）を有する結晶化ガラス（ SiO_2 : 76.0重量%、 Li_2O : 9.7重量%、 Na_2O : 1.0重量%、 K_2O : 3.5重量%、 MgO : 1.5重量%、 Al_2O_3 : 3.5重量%、 P_2O_5 : 3.0重量%、 TiO_2 : 1.5重量%、 As_2O_3 : 0.3重量%を含有するガラス）を、約4.

0℃/分の昇温速度で加熱しこの形成温度で1.5時間保持した後、約2.0℃/分の昇温速度で加熱して815℃で2.5時間保持したものを準備した。このガラス基板について、洗浄処理を行った後、ピロ硫酸カリウムの溶融塩で処理して、実施例1と同様にして、溶出試験*

(明細：結晶化ガラス)

	処 理 方 法	溶出試験結果	環境試験結果	表面観察結果
		Li, Na, Kの合計溶出量 ($\mu\text{mol/Disk}$)		
比較試料3	K2S2O7処理なし	4.8	5 μm 程度のヤケが密集	○
比較試料4	水蒸気導入なし K2S2O7処理 (250℃、5分)	0.1	5 μm 程度のヤケなし	○
試料3	水蒸気2時間供給後 K2S2O7処理 (250℃、5分)	0.1	5 μm 程度のヤケなし	○
試料4	水蒸気4時間供給後 K2S2O7処理 (250℃、5分)	0.1	5 μm 程度のヤケなし	○

K2S2O7液相温度:210℃

【0104】表4から、アルカリを含有したセラミックスについてもピロ硫酸カリウムの溶融塩による処理が効果的であることがわかる。

【0105】実施例3

ガラス基板として、主結晶相としてカリウム・フロロリヒタライト及びカリウム・カナサイトを有する結晶化ガラス(SiO₂:56.5重量%、MgO:11.8重量%、CaO:14.1重量%、Na₂O:5.4重量%、K₂O:8.7重量%、F:5.5重量%を含有するガラス)を、約4.0℃/分の昇温速度で加熱しこの※

(明細：結晶化ガラス)

20※形成温度で1.5時間保持した後、約2.0℃/分の昇温速度で加熱して840℃で2.5時間保持したものを準備した。このガラス基板について、洗浄処理を行った後、ピロ硫酸カリウムの溶融塩で処理して、実施例1と同様にして、溶出試験及び環境試験を実施した。また、比較のためピロ硫酸カリウムによる処理を行わない試料についても同様にテストした。それらの結果を表5に示す。

【0106】

【表5】

	処 理 方 法	溶出試験結果	環境試験結果	表面観察結果
		Li, Na, Kの合計溶出量 ($\mu\text{mol/Disk}$)		
比較試料5	K2S2O7処理なし	1.7	5 μm 程度のヤケが密集	○
比較試料6	水蒸気導入なし K2S2O7処理 (250℃、5分)	0.1	5 μm 程度のヤケなし	○
試料5	水蒸気2時間供給後 K2S2O7処理 (250℃、5分)	0.1	5 μm 程度のヤケなし	○
試料6	水蒸気4時間供給後 K2S2O7処理 (250℃、5分)	0.1	5 μm 程度のヤケなし	○

K2S2O7液相温度:210℃

【0107】実施例4

320℃でK₂S₂O₇110kgの溶融塩について、チームの導入時間と結晶析出時間との関係を調べた。そ

の結果を表6に示す。

【0108】

【表6】

条 件	結 晶 析 出	備 考
水蒸気導入なし	120時間後	
水蒸気導入3時間	220時間後	Air:2000cm ³ /min, Steam:1g/min
水蒸気導入(継続)	析出せず	Air:2000cm ³ /min, Steam:1g/min

【0109】水蒸気を導入しない場合120時間で結晶が析出したが、水蒸気を3時間導入した場合220時間で結晶が析出し、水蒸気を継続して導入した場合結晶は析出しなかった。

* 水分を補う方法の違いによる相違を調べた。その結果を表7に示す。

【0111】

【表7】

【0110】実施例5

*

条 件	結 晶 析 出	備 考
KHSO ₄ 添加	72時間後	KHSO ₄ 440 g 添加
水蒸気導入3時間	100時間後	Air:2000cm ³ /min, Steam:1g/min

【0112】結晶が析出した時点で水分を添加し、次に結晶が析出するまでの時間は、硫酸水素カリウム添加の場合72時間後であり、水蒸気を3時間導入した場合100時間後であった。なお、いずれの場合も水分添加により結晶はすぐに消失した。

※ 酸ナトリウムの熔融塩、硫酸水素カリウムの熔融塩、又は硫酸水素ナトリウムの熔融塩を用いたこと以外は実施例1と同様にして、溶出試験及び環境試験を実施した。その結果を表8に示す。

【0114】

【表8】

【0113】実施例6

ピロ硫酸カリウムの熔融塩の代わりに特級試薬のピロ硫酸※

(※ 高純度 (T102, Y203等) を含有したアルミノシリケートガラス)

	処 理 方 法	溶出試験結果	環境試験結果	表面観察結果
		Li, Na, Kの合計溶出量 (μmol/Disk)		
試料7	水蒸気2時間供給後 Na ₂ S ₂ O ₇ 処理(300℃、5分)	0.2	5μm程度ヤケなし	○
試料8	水蒸気4時間供給後 Na ₂ S ₂ O ₇ 処理(300℃、5分)	0.2	5μm程度ヤケなし	○
試料9	水蒸気2時間供給後 KHSO ₄ 処理 (300℃、5分)	0.2	5μm程度ヤケなし	○
試料10	水蒸気4時間供給後 KHSO ₄ 処理 (300℃、5分)	0.2	5μm程度ヤケなし	○
試料11	水蒸気2時間供給後 NaHSO ₄ 処理(300℃、5分)	0.2	5μm程度ヤケなし	○
試料12	水蒸気4時間供給後 NaHSO ₄ 処理(300℃、5分)	0.2	5μm程度ヤケなし	○

Na₂S₂O₇液相温度:190℃、KHSO₄液相温度:210℃、NaHSO₄液相温度:190℃

【0115】実施例7

特級試薬のピロ硫酸カリウムと特級試薬のピロ硫酸ナトリウムとを混合した熔融塩を用いたこと、又は特級試薬の硫酸水素カリウムと特級試薬の硫酸水素ナトリウムとを混合した熔融塩を用いたこと以外は実施例1と同様に

して、溶出試験及び環境試験を実施した。その結果を表9に示す。

【0116】

【表9】

(明細：高原子価イオン含有ガラス)

	処 理 方 法	溶出試験結果	環境試験結果	表面観察 結果
		Li, Na, Kの合計溶出量 ($\mu\text{mol/Disk}$)		
試料13	水蒸気2時間供給後 Na ₂ S ₂ O ₇ ・K ₂ S ₂ O ₇ 処理 (300℃, 5分)	1.1	5 μm 以内ヤケなし	○
試料14	水蒸気4時間供給後 Na ₂ S ₂ O ₇ ・K ₂ S ₂ O ₇ 処理 (300℃, 5分)	1.2	5 μm 以内ヤケなし	○
試料15	水蒸気2時間供給後 NaHSO ₄ ・KHSO ₄ 処理 (300℃, 5分)	1.1	5 μm 以内ヤケなし	○
試料16	水蒸気4時間供給後 NaHSO ₄ ・KHSO ₄ 処理 (300℃, 5分)	1.2	5 μm 以内ヤケなし	○

Na₂S₂O₇・K₂S₂O₇=50wt%:50wt%, NaHSO₄・KHSO₄=50wt%:50wt%Na₂S₂O₇・K₂S₂O₇液相温度:150℃、NaHSO₄・KHSO₄液相温度:150℃

【0117】実施例8

*10に示す。

ピロ硫酸カリウムに硫酸を重量比で1:1になるように 【0118】

加えてなる溶融塩を用いたこと以外は実施例1と同様に 20 【表10】

して、溶出試験及び環境試験を実施した。その結果を表*

(明細：高原子価イオン含有ガラス)

	処 理 方 法	溶出試験結果	環境試験結果	表面観察 結果
		Li, Na, Kの合計溶出量 ($\mu\text{mol/Disk}$)		
試料17	水蒸気2時間供給後 K ₂ S ₂ O ₇ +硫酸 処理 (300℃, 5分)	0.2	5 μm 以内ヤケなし	○
試料18	水蒸気4時間供給後 K ₂ S ₂ O ₇ +硫酸 処理 (300℃, 5分)	0.2	5 μm 以内ヤケなし	○

K₂S₂O₇:硫酸=50wt%:50wt%

【0119】実施例9~11

高原子価金属イオン含有ガラスの代わりに、アルミノシリケートガラス（組成：モル%表示で、SiO₂を57~74%、ZrO₂を0~2.8%、Al₂O₃を3~1.5%、Li₂Oを7~16%、Na₂Oを4~14%主成分として含有、T_g:500℃、化学強化処理:400℃、3時間）（実施例9）、ソーダライムガラス（実施例10）、ソーダアルミノシリケートガラス（実施例11）

1)、重金属イオンを含有するボロシリケートガラスを用いたこと以外は実施例1と同様にして、溶出試験及び環境試験を実施した。その結果、実施例1と同様の効果が認められた。なお、実施例9（アルミノシリケートガラス）の結果を表11に示す。

【0120】

【表11】

(銅層：アルミノシリケートガラス)

	処 理 方 法	抽出試験結果	環境試験結果	表面観察 結果
		Li, Na, Kの合計抽出量 ($\mu\text{mol/Disk}$)		
比較試料7	K2S2O7処理なし	2.0	5 μm 以上のヤケが密集	○
比較試料8	水蒸気導入なし K2S2O7処理 (250℃、5分)	0.1	5 μm 以上のヤケなし	○
比較試料9	水蒸気導入なし K2S2O7処理 (300℃、5分)	0.0	5 μm 以上のヤケなし	○
試料19	水蒸気2時間供給後 K2S2O7処理 (250℃、5分)	0.1	5 μm 以上のヤケなし	○
試料20	水蒸気4時間供給後 K2S2O7処理 (250℃、5分)	0.1	5 μm 以上のヤケなし	○
試料21	水蒸気2時間供給後 K2S2O7処理 (300℃、5分)	0.0	5 μm 以上のヤケなし	○
試料22	水蒸気4時間供給後 K2S2O7処理 (300℃、5分)	0.0	5 μm 以上のヤケなし	○

K2S2O7液相温度:210℃

【0121】なお、上記実施例1～11中、化学強化処理した基板を熔融塩にて処理した実施例1、6、7、8、9の熔融塩処理後の基板には応力緩和は殆ど認められなかった。

【0122】実施例12

実施例1～11で得られた磁気ディスク用ガラス基板の両面に、Al(膜厚50オングストローム)/Cr(1000オングストローム)/CrMo(100オングストローム)からなる下地層、CoPtCr(120オングストローム)/CrMo(50オングストローム)/CoPtCr(120オングストローム)からなる磁性層、Cr(50オングストローム)保護層をインライン型スパッタ装置で形成した。

【0123】上記基板を、シリカ微粒子(粒径100オングストローム)を分散した有機ケイ素化合物溶液(水とIPAとテトラエトキシシランとの混合液)に浸し、焼成することによってSiO₂からなる保護層を形成し、さらに、この保護層上をパーフロロポリエーテルからなる潤滑剤でディップ処理して潤滑層を形成して、MRヘッド用磁気ディスクを得た。

【0124】得られた磁気ディスクについてグライドテストを実施したところ、基板の変形、及びアルカリの溶出やヤケ等による異物に起因するヒットやクラッシュは認められなかった。また、磁性層等の膜に欠陥が発生していないことも確認できた。

【0125】また、耐候性及び寿命を調べたところ、ガラス基板表面の変質に起因する磁性膜等の劣化や欠陥は認められなかった。

【0126】実施例13

実施例1～11で得られた磁気ディスク用ガラス基板の両面に、インライン式のスパッタリング装置を用いて、Cr下地層、CrMo下地層、CoPtCr磁性層、C保護層を順次成膜して磁気ディスクを得た。上記磁気ディスクについて実施例12と同様のことが確認された。

【0127】実施例14

下地層をAl/Cr/Crとし、磁性層をCoNiCrTaとしたこと以外は実施例13と同様にして薄膜ヘッド用磁気ディスクを得た。上記磁気ディスクについて実施例12と同様のことが確認された。

【0128】以上好ましい実施例をあげて本発明を説明したが、本発明は必ずしも上記実施例に限定されるものではない。

【0129】例えば、ピロ硫酸塩等の熔融塩の加熱温度、種類、浸漬時間等は実施例のものに限定されず要求品質レベル等に応じ適宜変更して実施できる。また、製造工程中の任意の工程の後に、必要に応じ、洗浄工程を実施できる。

【0130】

【発明の効果】以上説明したように本発明方法によれば、情報記録媒体用基板を、硫酸水素塩等の熔融塩に浸漬して処理することで、アルカリ等の溶出を著しく抑えることができるとともに、処理液に水分を供給又は補うことで、水分が蒸発しピロ硫酸塩の結晶が析出して処理の効果が低下することがなく、処理の効果を持続しつつ長期間連続して均一に処理できる。

【0131】また、本発明の情報記録媒体によれば、アルカリ等の溶出を著しく抑制できる情報記録媒体用基板を使用しているため、耐候性及び寿命に優れた高い信頼性

を有する情報記録媒体を製造できる。

【0132】さらに、本発明のガラス製品及びその製造方法によれば、アルカリやその他の成分の溶出を著しく抑えた製品が得られるので、耐候性及び寿命に優れた信頼性を有するガラス製品が得られる。

【図面の簡単な説明】

【図1】水蒸気の供給方法の一態様を説明するための図である。

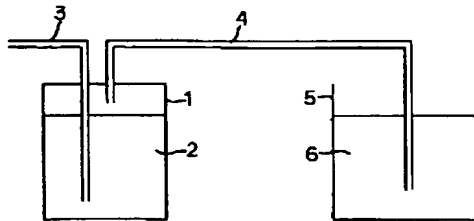
【図2】水蒸気の供給方法の他の態様を説明するための*

*図である。

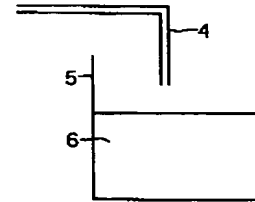
【符号の説明】

- | | |
|---|-------|
| 1 | 密閉容器 |
| 2 | 水 |
| 3 | エア供給管 |
| 4 | スチーム管 |
| 5 | 処理槽 |
| 6 | 溶融塩 |

【図1】



【図2】



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